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DESIGN GUIDELINES AND CRITERIA FOR USER/ OPERATOR TRANSACTIONS WITH BATTLEFIELD AUTOMATED SYSTEMS

VOLUME III-D:

HUMAN FACTORS ANALYSES OF USER/ OPERATOR TRANSACTIONS WITH IISS-FMS--THE INTELLIGENCE INFORMATION SUBSYSTEM FIRST MILESTONE

HUMAN FACTORS TECHNICAL AREA

February 1981

U.S. ARMY RESEARCH INSTITUTE for the BEHAVIORAL and SOCIAL SCIENCES

U. S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the Deputy Chief of Staff for Personnel

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This document is one of a series in the Final Report of Phase I in a project to develop design guidelines and criteria for user/operator transactions with battlefield automated systems. The report is organized in five volumes as follows:

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Item 20 (Cont'd)

I. Executive Summary (RR 1320)
II. Technical Report (TR 536)
III. In-Depth Analyses of Individual Systems
  A. Tactical Fire Direction System (TACFIRE) (RP 81-26)
  B. Tactical Computer Terminal (TCT) (RP 81-27)
  C. Admin/Log Automated Systems (RP 81-28)
  D. Intelligence Information Subsystem (IISS) (this report)
IV. Provisional Guidelines and Criteria (TR 537)
V. Background Literature (TR 538)

Volume I presents a succinct review of activities and products of the project's first phase. Volume II contains a technical discussion of the project's objectives, methodologies, results, conclusions, and implications for the design of user/operator transactions with battlefield automated systems. Volume III documents analyses of four unique battlefield automated systems selected to represent different stages of system development and different Army functional areas. Volume IV presents provisional guidelines and criteria for the design of transactions. Volume V provides a brief review of selected literature related to guidelines and criteria.

Research Product 81-29

DESIGN GUIDELINES AND CRITERIA FOR USER/ OPERATOR TRANSACTIONS WITH BATTLEFIELD AUTOMATED SYSTEMS

VOLUME III-D:

HUMAN FACTORS ANALYSES OF USER/ OPERATOR TRANSACTIONS WITH IISS-FMS--THE INTELLIGENCE INFORMATION SUBSYSTEM FIRST MILESTONE

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Human Performance Effectiveness and Simulation

FOREWORD

The Human Factors Technical Area of the Army Research Institute (ARI) is concerned with helping users and operators cope with the ever increasing complexity of the battlefield automated systems by which they acquire, transmit, process, disseminate, and utilize information. Increased system complexity increases demands imposed on the human interacting with the machine. ARI's efforts in this area focus on human performance problems related to interactions with command and control centers, and on issues of system design and development. Research is addressed to such areas as user-oriented systems, software development, information management, staff operations and procedures, decision support, and systems integration and utilization.

An area of special concern in user-oriented systems is the improvement of the user-machine interface. Lacking consistent design principles, current practice results in a fragmented and unsystematic approach to system design, especially where the user/operator-system interaction is concerned. Despite numerous design efforts and the development of extensive system user information over several decades, this information remains widely scattered and relatively undocumented except as it exists within and reflects a particular system. The current effort is dedicated to the development of a comprehensive set of Human Factors guidelines and evaluation criteria for the design of user/operator transactions with battlefield automated systems. These guidelines and criteria are intended to assist proponents and managers of battlefield automated systems at each phase of system development to select the design features and operating procedures of the human-computer interface which best match the requirements and capabilities of anticipated users/operators.

Research in the area of user-oriented systems is conducted as an in-house effort augmented through contracts with uniquely qualified organizations. The present effort was conducted in collaboration with personnel from Synectics Corporation under contract MDA903-80-C-0094. The effort is responsive to requirements of Army Project 2Q263744A793, Human Performance Effectiveness and Simulation, and to special requirements of the U.S. Army Combined Arms Combat Developments Activity (CACDA), Fort Leavenworth, Kansas.

JOSEPH ZEIDNER
Technical Director

DESIGN GUIDELINES AND CRITERIA FOR USER/OPERATOR TRANSACTIONS WITH BATTLEFIELD AUTOMATED SYSTEMS VOLUME III-D: HUMAN FACTORS ANALYSIS OF USER/OPERATOR TRANSACTIONS WITH THE INTELLIGENCE INFORMATION SUBSYSTEM FIRST MILESTONE SYSTEM (IISS-FMS)

EXECUTIVE SUMMARY

Requirement:

To develop a comprehensive set of human factors guidelines and criteria for the design of user/operator transactions in battlefield automated systems for use by human factors specialists and system proponents, managers, and developers.

Procedure:

To provide data for a baseline functional description of user/operator transactions in battlefield automated systems, user-computer interactions in IISS were analyzed using a Transaction Feature Analysis technique. Data were collected during interviews with system experts and reviews of system documentation. The analysis focused on system design features that affect user/operator performance of transactional tasks.

Findings:

IISS is very versatile and contains many design features which should make it easy to use including incorporation of the powerful GIM language, menus which require light penning of desired options, and a generous number of both fixed and variable function keys. Advantageous design features are not necessarily well designed, however. Design deficiencies which are especially important include lack of adequate HELP information, cryptic error messages, absence of on-screen information about legal command and data entry content, cramped displays and data entry formats, and poor system response times. None of the IISS human-machine interface problems observed would cause the system to fail catastrophically. Likewise, no IISS design defect discussed in this report would prohibit IISS users/operators from performing their assigned functions. Nonetheless, it is likely that many of the problems would degrade system performance by increasing user frustration and error rates, decreasing throughput, and compromising order-of-battle data base quality. Specific recommendations for improvements in IISS are presented relative to each cited design deficiency.

Utilization of Findings:

Findings from the analysis of individual systems may be useful to proponents in specifying user/operator requirements for future system evolution. In this project, the findings were incorporated in a data base on human factors requirements which provided the "real world" foundation for development of the provisional guidelines and criteria presented in volume IV of this report. The provisional guidelines and criteria will be utilized as the basis for development of the prototype handbook.

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SUMMARY

This document reports a human factors-oriented analysis of user/operator transactions with the Intelligence Information Subsystem (IISS). Subject matter experts were interviewed and system documents were reviewed to learn about hardware, software, and procedural design features that affect these transactions. Observations were recorded with a Transaction Feature Analysis technique developed for this purpose. Transaction features analyzed with the technique were arranged by categories to facilitate presentation and discussion.

IISS contains many design features which should make it easy to use. These features are not, however, always well designed. Nor are they always used for processes in which they would provide the most benefit to IISS user/operators. Design deficiencies which are especially important include: an almost complete lack of HELP information; generally cryptic error messages; the absence of on-screen information about legal command and data entry content; cramped display and data entry formats; and poor system response times. None of the IISS human-machine interface problems observed would cause the system to fail catastrophically. Likewise, no IISS design defect discussed in this report would prohibit IISS users/operators from performing their assigned functions. It is likely, however, that many of the problems would degrade system performance by: increasing error rate; decreasing throughput; increasing user frustration; and compromising order-of-battle data base quality.

Recommendations for improvements in the IISS are summarized in the table below. The table is organized by categories of design features as described in the report. Each recommendation is evaluated according to the best judgment of the analysts in terms of hardware changes, software reprogramming, or changes in operating system procedures. Evaluations cannot be expressed in quantitative terms because appropriate data could not be collected. Therefore, the evaluation is expressed in terms of low (L), moderate (M), or high (H) impact on hardware, software, and performance. A minus sign indicates negative impact (cost) and a plus sign indicates positive impact (benefit).

Table 1

Summary of Recommended Design Features and Extraction of Their Impact

CATEGORY	RECOMMENDATIONS	IMPACT* Hardware	Software	User Operator/ Performance
CONTROL METHODS				
1.1 Command Language	. Provide all GIM-II capabilities in MMI.	None	M-	L+
1.2 Menus	. Increase amount of information in menu displays.	None	-	L+
	. Break forms preparation into logical steps (START DEVICE, USER MESSAGE, BDT, RJE).	None	L-	L+
	. Provide "front end" for H6000 RJE commands.	None	M-	L+
	. Provide for issuing SEND command without using SEND key.	None	L-	L+
	. Provide alternative to light pen for menu selection.	None	L-	L+
	. Break GIM-II MENU into greater number of less dense menus.	None	L-	L+
1.3 Function Keys	. Include HELP displays for function key action.	None	L-	L+
	. Prompt user/operator in use of function keys.	None	-	L+
1.4 Hybrid Methods	*****NO RECOMMENDATIONS*****			
1.5 Prompts/HELPS	. Provide hierarchical, interleaved HELP capability.	None	M+	M+
	. Provide legal values information in HELP files.	None	L-	M+
	. Provide prompts and HELPS for FFKs and VFKs.	None	L-	L+
	. Make HELP display in IISS consistent with current capabilities.	None	-	L+
DISPLAY				
2.1 Fixed Alphanumeric Displays	. Provide subfield delimiters in GEO coordinate display.	None	L-	H+
	. Provide subfield delimiters in date display.	None	L-	M+
	. Provide subfield delimiters in time display.	None	L-	L+
	. Provide subfield delimiters in DTG display.	None	L-	L+
2.2 Variable-length Alphanumeric Display	. Provide for reorganization of index list under user/operator control.	None	L-	L+
2.3 Graphic Displays	. Provide graphic display capability on SU 1652.	None	L-	M+
2.4 Highlighting	. Use highlighting capabilities of SU 1652 in appropriate situations.	None	L-	M+

Table 1. Continued

CATEGORY	RECOMMENDATIONS	IMPACT* Hardware	Software	User Operator/ Performance
3. DATA ENTRY ASSISTANCE				
3.1 Information on Legal Entries	. Present legal input values stored in GIM-II dictionaries.	None	L-	L+
	. Present legal values or value ranges for option switch parameters.	None	L-	L+
	. Present /FI as valid option.		-	L+
	. Present legal values for all categorical order-of-battle data base fields.	None	H-	M+
	. Present legal values for all categorical JINTACCS fields in message preparation.	None	H-	M+
3.2 Unburdening of Input	. Provide method for storing retrieval specifications for later use.	None	L-	M+
	. Provide for using place names as center point of circle search.	None	H-	M+
	. Provide for using unit IDs and alternate names as center point of circle search.	None	M-	M+
	. Provide defaults and conventions for naming files	None	M-	L+
3.3 Interrupts and Work Recovery	. Provide indication of messages waiting in queue.	None	L-	L+
	. Provide for forms support of partially completed JINTACCS messages.	None	L-	M+
4. MESSAGE COMPOSITION AIDS				
4.1 System Design Features	. Provide interleaved HELP for legal values in JINTACCS message completion.	None	L-	M+
	. Provide menu-driven JINTACCS message completion.	None	M-	M+
4.2 Format for Alphanumeric Messages	. Constrain JINTACCS prompts to information available from Army.	None	L-	L+
4.3 Graphic Messages	. Provide for preparation, transmission, and receipt of graphics messages.	None	H-	M+

Table 1. Continued

CATEGORY	RECOMMENDATIONS	IMPACT* Hardware	Software	User Operator/ Performance
DATA RETRIEVAL ASSISTANCE		None		
5.1 Query Method	. Provide for determination of distance between two points.	None	L-	L+
5.2 Query Structure	. Provide verify capability for deletion from multivalued fields.	None	L-	M+
	. Include orientation information in data base.	None	L-	L+
	. Implement route search function.	None	M-	L+
GLOSSARIES				
6.1 Standard Terms	. Establish and enforce consistency in IISS command terminology.	None	-	M+
6.2 Abbreviations and Coding	. Establish and maintain consistence in IISS codes and abbreviations.	None	L-	L+
ERROR HANDLING				
7.1 Prevention	*****NO RECOMMENDATIONS*****			
7.2 Detection	. Evaluate GIM-II strings as they are entered.	None	M-	L+
7.3 Feedback	. Provide more informative and tailored error messages.	None	M-	M+
7.4 Correction/Recovery	. Eliminate necessity for meaningless changes to multi-line commands.	None	L-	L+

= Low, M = Moderate, H = High impact; (+) = positive impact (benefit), (-) = negative pact (cost).

PURPOSE AND MAJOR FUNCTIONS

"The IISS FMS[1] is an all-source, mobile, tactical intelligence data handling system."[2] In part derived from the Army System for Standard Intelligence Terminals (ASSIST), the FMS is an independent subsystem of the U.S. Army Europe (USAREUR) Command and Control Information System (CCIS). It extends the information processing and intelligence disseminating capabilities currently provided by the U.S. European Command's Analyst's Information Display and Exploitation System (EUCOM AIDES) and by ASSIST. Indeed, TRW provides a software package that upgrades ASSIST to roughly the same capabilities as the FMS.

The major purpose of the FMS is to assist intelligence analyst users to provide accurate and timely tactical intelligence to commanders in Army Corps and subordinate echelons of USAREUR, down to the division or separate brigade level. Its primary functions[3] are:

1. On-line ADP support to intelligence analysts.
2. Access to multiple intelligence data bases through remote terminals and interconnected facilities.
3. Machine-aided sanitization of intelligence for release to collateral systems.
4. Acceptance of products from tactical collection systems.
5. Processing of ELINT data.

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[1]/Also referred to in some quarters as "IISS", and in the TRW documentation more simply as "FMS".

[2]/*Hardware Operations Manual for Intelligence Information Subsystem (IISS) First Milestone System (FMS)*. TRW Defense and Space Systems Group, Document No. 28503-W104-RU-00, 6 June 1979, page 1.

[3]/These functions are derived from the FMS Hardware Operations Manual (see Note 2 above) and from *IISS User's Manual*. TRW Defense and Space Systems Group, Document No. 28503-W094-RU-00, 10 May 1979.

6. Processing of data base files on records extracted from the EUCOM AIDES Integrated Data Base (IDB) and the USAREUR Integrated Ground Order-of-Battle System (IGOBS) data base.

7. Dissemination of user-to-user message traffic in FMS and upgraded ASSIST.

8. Access to:

   a. FMS Tactical Order-of-Battle (TACOB) data base.

   b. FMS Training data base.

   c. ASSIST Locally Developed Files data base.

   d. EUCOM AIDES IDB (through time sharing and remote job entry).

RELEVANT HARDWARE ELEMENTS

IISS's hardware elements are contained in three truck-mounted complexes: a Mobile Intelligence Center (MIC) and two Mobile Remote Intelligence Terminals (MRITs).

MOBILE INTELLIGENCE CENTER

The MIC provides the primary FMS data base and a master control terminal for the system. Through the Intelligence Data Handling System Communications II (IDHSC-II) network, AUTODIN, and local facilities, the MIC also serves as the primary communication center for the FMS, linking the MIC and MRITs to each other and to:

1. Tactical collection system inputs.

2. EUCOM AIDES.

3. National files and the DoD Intelligence Information System (DODIIS).

Each MIC contains, among other equipment, an AN/GYQ-21(V) computer (based on the Digital Equipment Corporation's PDP-11/70) with a 1.128-Mbyte memory, five 67-Mbyte disk drives, three nine-track tape drives, a high speed impact line printer, one analyst terminal, one computer terminal, an AUTODIN interface terminal, and high security communications equipment. The MIC, as shown

in Figure 1, is housed in three truck-mounted, radio frequency interference (RFI) shielded shelters.

MOBILE REMOTE INTELLIGENCE TERMINAL

The MRIT provides workstations for either three or seven intelligence analyst users, depending on configuration. Figure 2 shows a seven-position, large MRIT (MRIT-L); a three-position, small MRIT (MRIT-S) consists of the two outer shelters shown in the figure. Both the large and small MRIT provide a local data base, and when deployed can also contain the TACOB data base. Each also serves as a secondary communications center for tactical collection system inputs via AUTODIN, and for the MRITs' communications with the MIC, other MRITs, and remote user terminals.

The MRIT equipment includes an AN/GYQ-21(V) with a 640-Kbyte memory, three 67-Mbyte disk drives, one nine-track tape drive, a high-speed, electrostatic line printer, three or seven analyst terminals, a CALCOMP 990 high-speed plotter, an AUTODIN interface terminal, and high security communications equipment.

REMOTE TERMINALS

In addition to equipment housed in the MIC and MRIT shelter complexes, the FMS also provides support to remote terminals. Currently, these terminals are located at V and VII Corps, and at PCAC, 66th MI, the U.S. Command in Berlin, and the USAREUR Systems Division.[4] Other remote terminals can be added as needed, because each MRIT is capable of supporting up to ten. Figure 3 shows the functional interrelationships of the system components.

SU 1652 USER TERMINAL

Of greatest importance to this contract is the hardware with which users/operators communicate with the system. The bulk of that communication takes place through OS-389(V)/G intelligent terminals in the Sperry Univac type SU 1652 configuration.

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[4] */IISS User's Manual*, Figure 2-1, page 2-6.

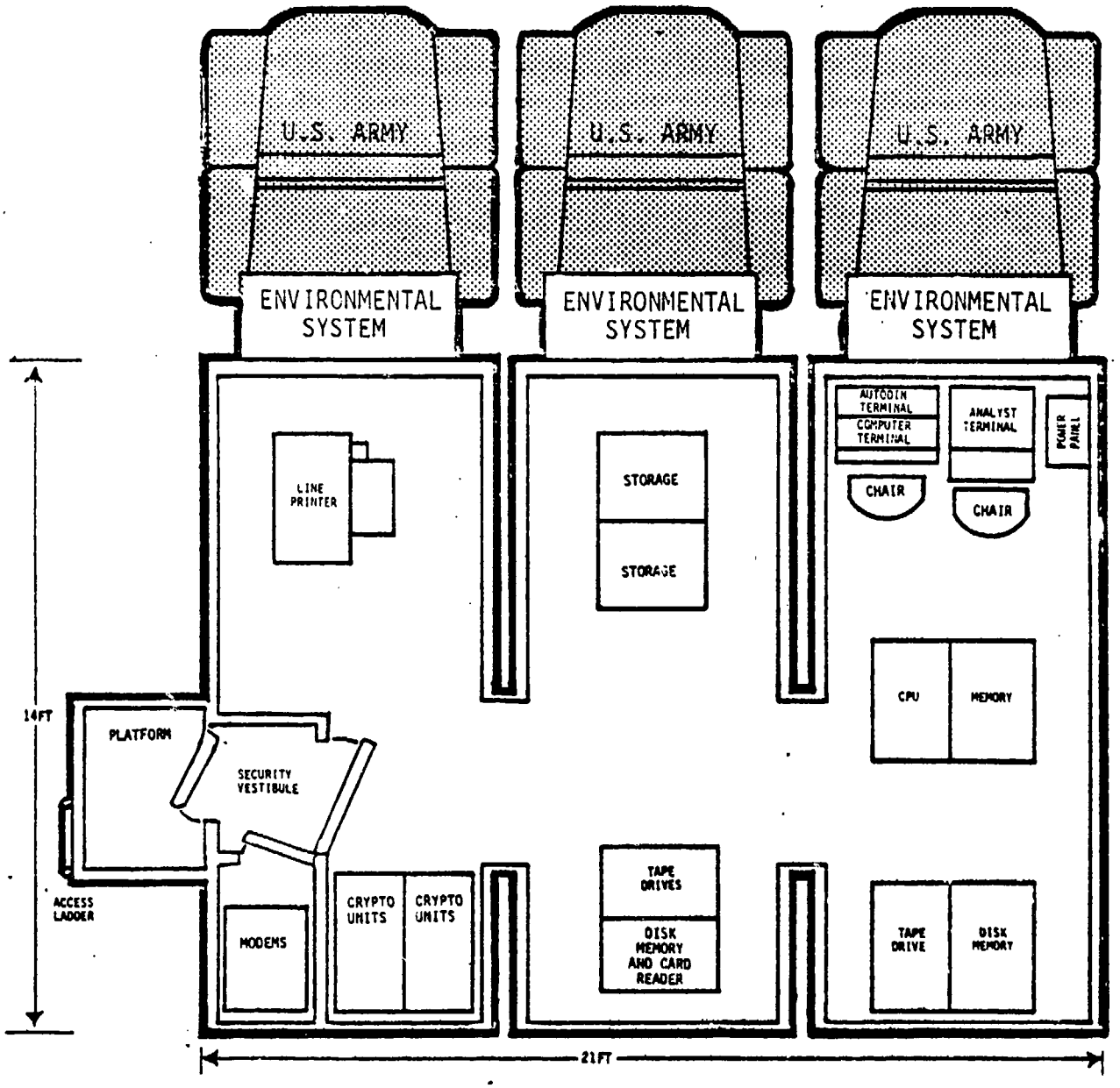

Figure 1. The FMS Mobile Intelligence Center (MIC). Reproduced from *IISS Intelligence Information Subsystem for USAREUR*. TRW pamphlet, 1978.

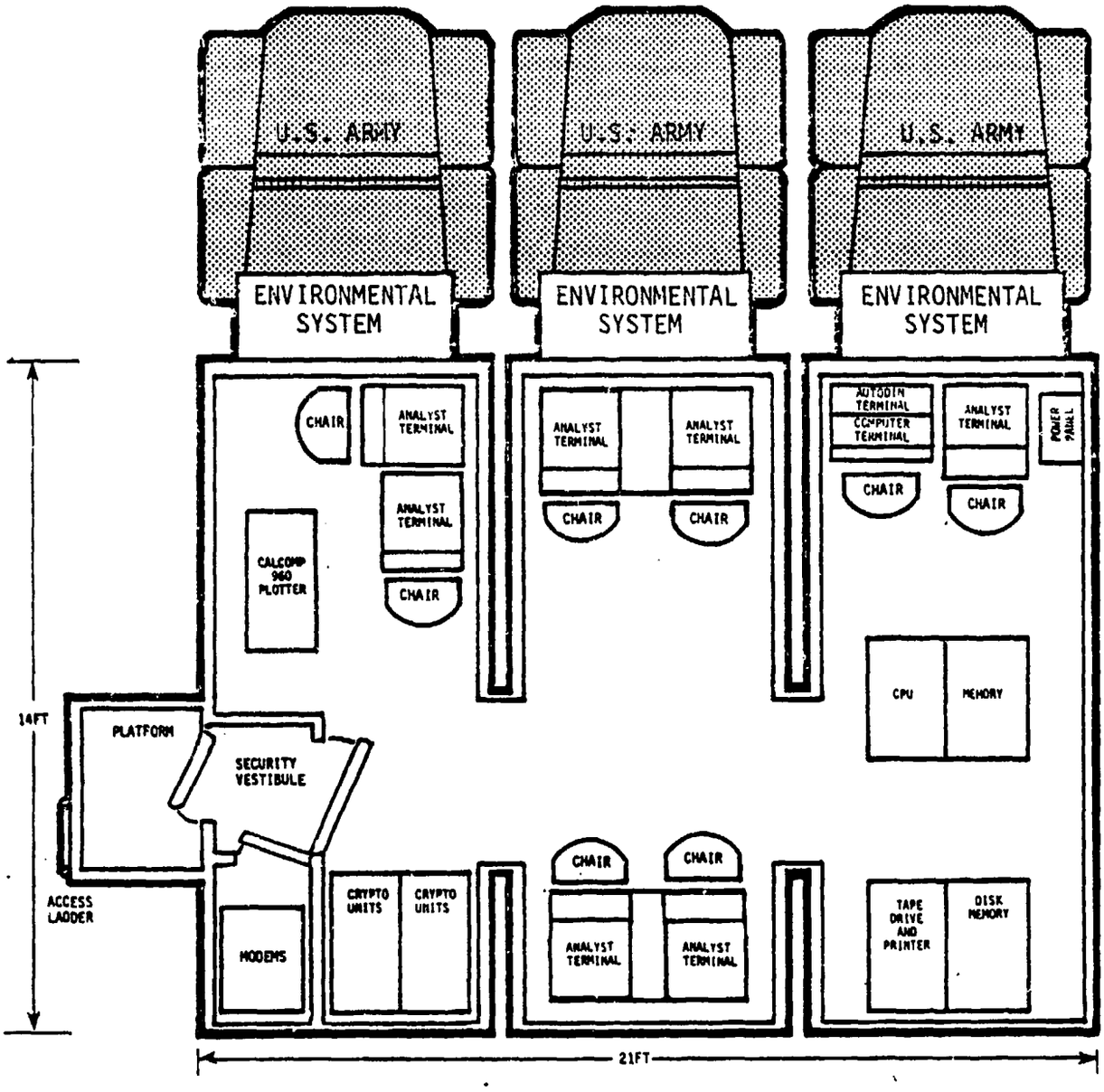

Figure 2. A Three-Shelter Mobile Remote Intelligence Terminal (MRIT-L). (An MRIT-S is formed by using the two outer shelters above.) Reproduced from *IISS Intelligence Information Subsystem for USAREUR*. TRW Pamphlet, 1978.

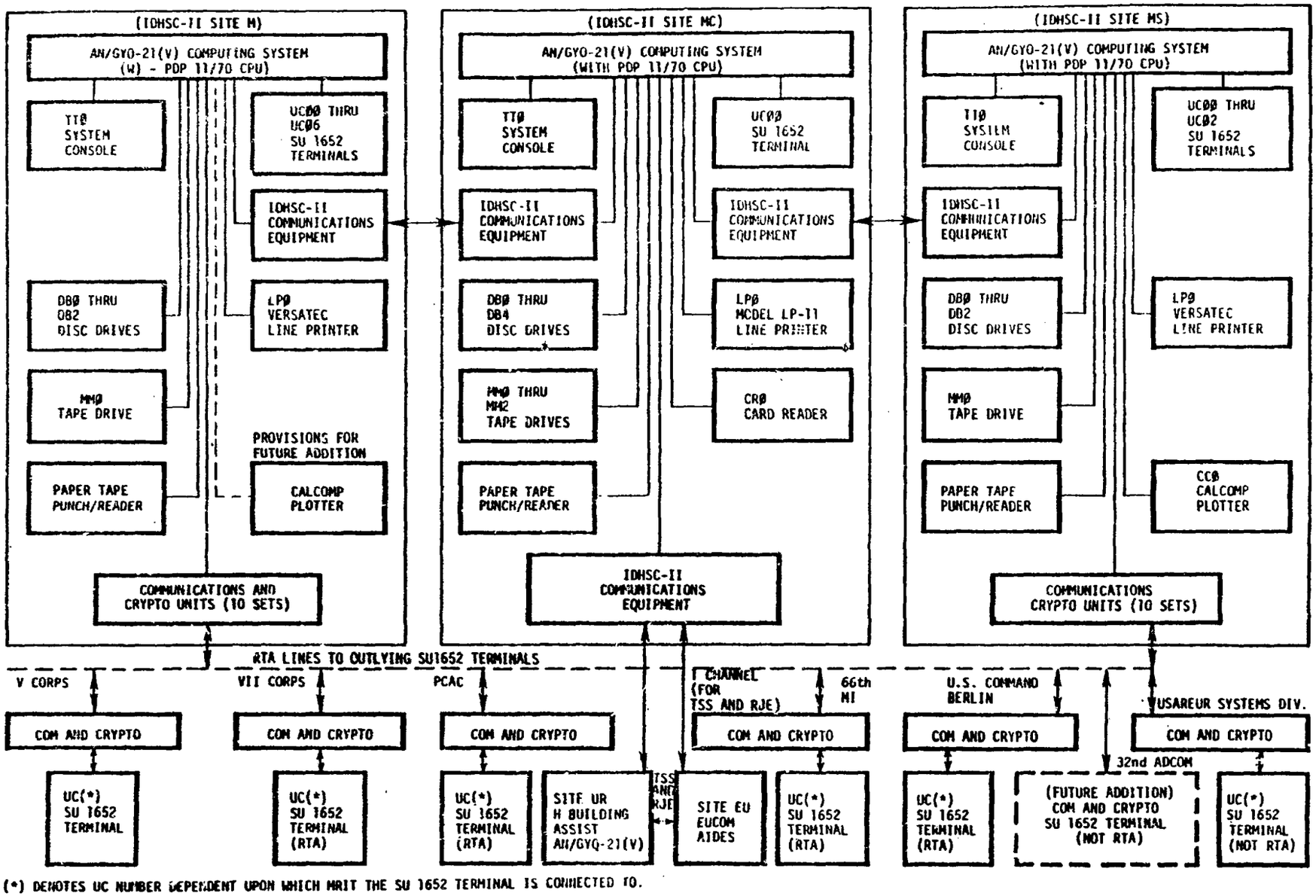

Figure 3. FMS Functional Interrelationships. Redrawn from *IISS User's Manual*, p. 2-8.

> The SU 1652 user terminal contains dual screen CRT displays, a light pen on the right side, an alphanumeric keyboard and two types of function keys: Fixed Function Keys (FFKs) and Variable Function Keys (VFKs). The FFKs are divided into three groups, known as the upper, left and right FFKs, all positioned around the alphanumeric keyboard. The variable function keys (VFKs) are located on pads on each side of the left and right FFKs. The term variable in VFKs means the key can be either on or off, indicated by a panel light next to the key. Note that the left and right FFKs are different from the VFKs in that they have no on/off indicators and are always active.[5]

The keyboard configuration is displayed in Figure 4.

The two CRT displays are subdivided into screen areas (SA), as shown in Figure 5. These are:

SA-1 1 line on the top of the left screen for classification.

SA-2 19 lines in the middle of the left screen used as the major user area.

SA-3 4 lines on the bottom of the left screen used for messages.

SA-4 1 line on the top of the right screen for classification.

SA-5 19 lines in the middle of the right screen used as the major user area.

SA-6 4 lines for Command Line input and output, system status messages and error messages.

The FFKs located around the alphanumeric keyboard are used to perform editing and data positioning functions on the displayed data.

> The SU 1652 User terminal features contain editing capabilities, such as character insertion and deletion, line changes, character string block manipulation and storage of limited data in the terminal. There is one left FFK, the "SEND FFK," that is very important to the user. The SEND FFK signals the external system computer to read the data in the SA containing the cursor and transmit that data to the system computer; this is how display data is transmitted to the system computer.[6]

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[5] *Ibid*, page 2-29

[6] *Ibid*, page 2-29

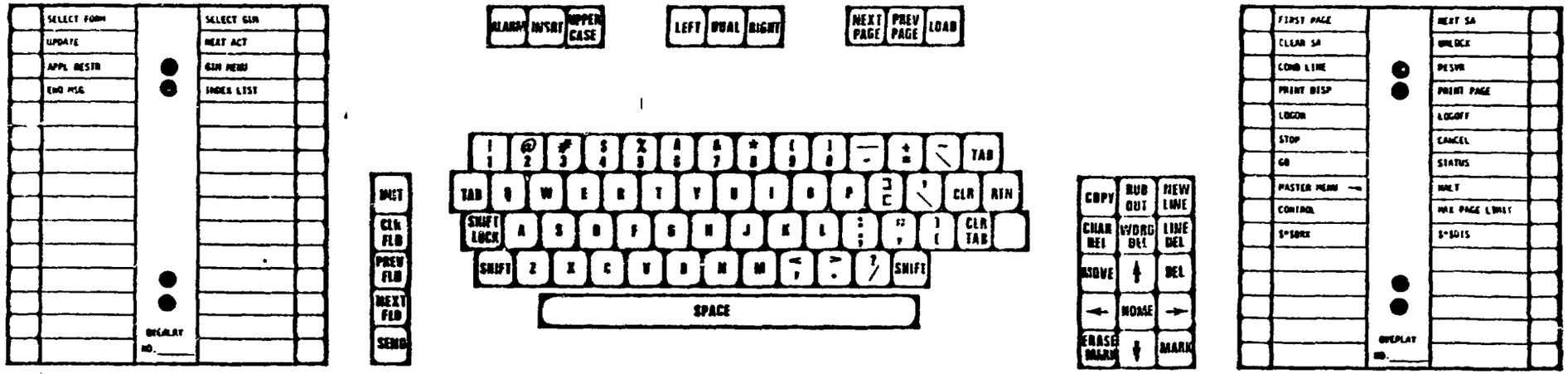

Figure 4. SU 1652 Keybaord and Controls.

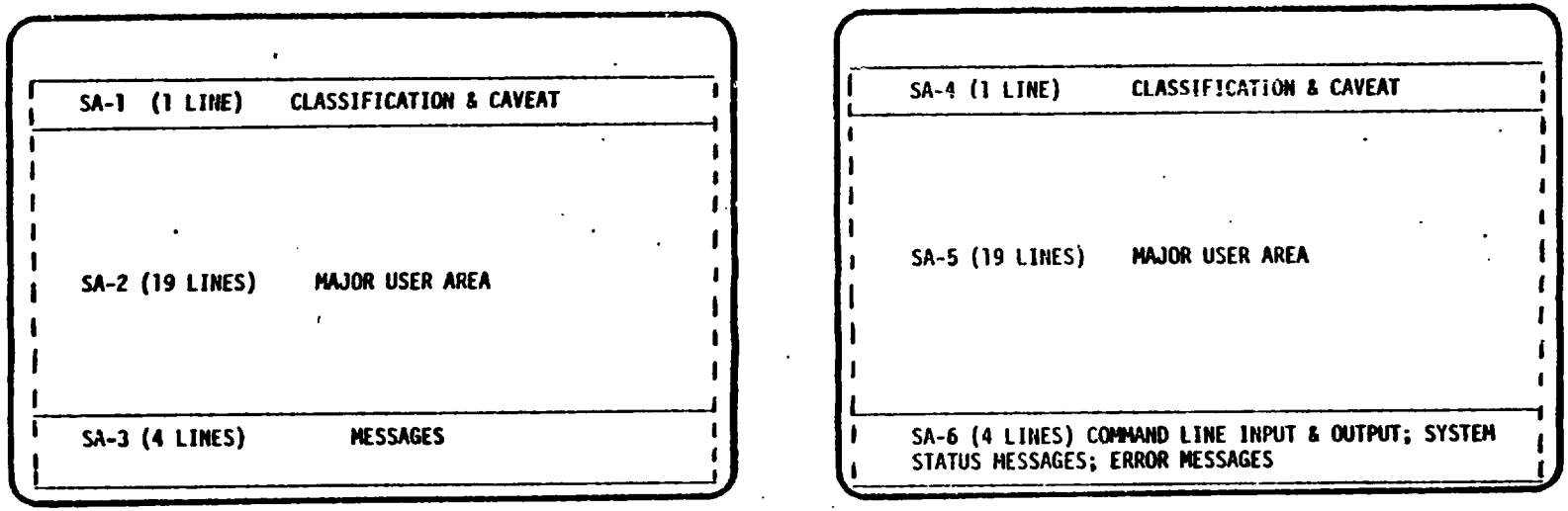

Figure 5. Screen Areas of the SU 1652 Display Implemented in IISS.

The location and function of the SU 1652 fixed function keys are presented in Appendix B.

> The Variable Function Keys (VFKs) provide the user a means of making entries controlling his interactive terminal environment and responding to FMS prompts. A VFK is active when the light indicator is on. Typically, the pattern of active keys on the left and right pads can change as a user proceeds through a menu option.[7]

The location and function of assigned VFKs are presented in Appendix C.

OTHER EQUIPMENT

There are several other pieces of hardware with which the user may interact at times. These include a line printer and a plotter. Acquisition of terminal printers is currently being considered. The other hardware such as the disk and tape drive, the computer, the crypto units and AUTODIN terminal are not used by the analyst user/operator. Therefore, only the interactions with the user terminal will be considered in this report.

RELEVANT SOFTWARE ELEMENTS

The AN/GYQ-21(V) computers in the MIS and MRIT are, as noted earlier, based on the Digital Equipment Corporation (DEC) PDP 11/70. The machines operate under control of DEC's RSX-11D operating system (OS). To satisfy the particular requirements of the application, an FMS Executive System specifically written for the IISS interfaces with the OS to allocate computer resources such as memory and buffers to various software tasks, to schedule execution of these tasks, and to provide necessary security functions. In practice, the OS and the executive are invisible to the functional personnel who are the system's primary users/operators. For this reason, these software elements are not discussed further in this report.

IISS basically uses the command language method to provide the human-computer software interface. Though the system includes a few menus and some

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[7] *Ibid*, page 2-34

applications of a "fill-in-the-blanks" approach, most transactions are performed by constructing command language statements, either with or without computer assistance. One can think of IISS functions divided into two groups: "utility" functions, and data base manipulation functions. Utility functions are performed with command statements using essentially the DEC monitor format, if not precisely the DEC verbs and "switches." Data base manipulations, on the other hand, are performed with command statements provided by DEC in its Generalized Information Management System II (GIM-II). These elements are discussed in greater detail below.

GENERAL STRUCTURE OF IISS SOFTWARE INTERFACE

IISS provides twenty-two separate functions to support the data processing requirements of its intelligence analyst-users/operators. The general structure of these functions is shown in Figure 6. The figure illustrates three "modes" of human-computer interaction: Man-Machine Interface (MMI), TELETYPE, and GIM Language. The reader should be advised that a user/operator is not necessarily aware of being in one mode versus another. Nor is there evidence that system developers deliberately structured IISS in this way. However, Figure 6 provides a convenient structure for discussing software elements relevant to this project.

The figure shows that, after the user/operator logs onto the system, the computer automatically displays a MASTER MENU (Figure 7). All sessions with the IISS begin with this menu, and many of them will employ it one or more times subsequently. Notice, however, that four of the options are restricted to personnel with special training. Additionally, although human-computer interaction in IISS always starts with a menu, later transactions employ a command language method, for the most part. The means by which the user/operator constructs command statements depends on the "mode" depicted in Figure 6. These modes are discussed on page 13 and following; the various software functions are described in Appendix D.

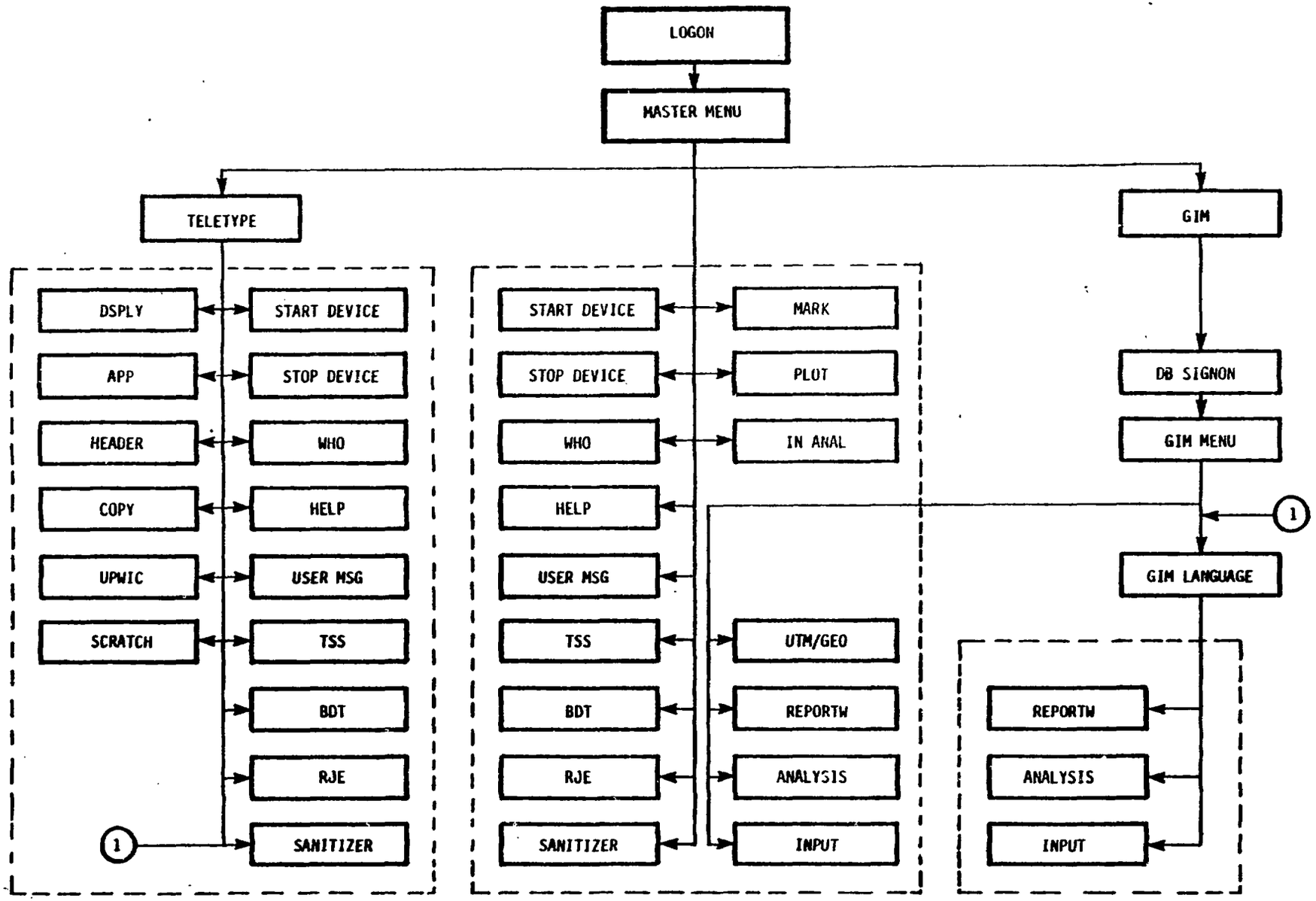
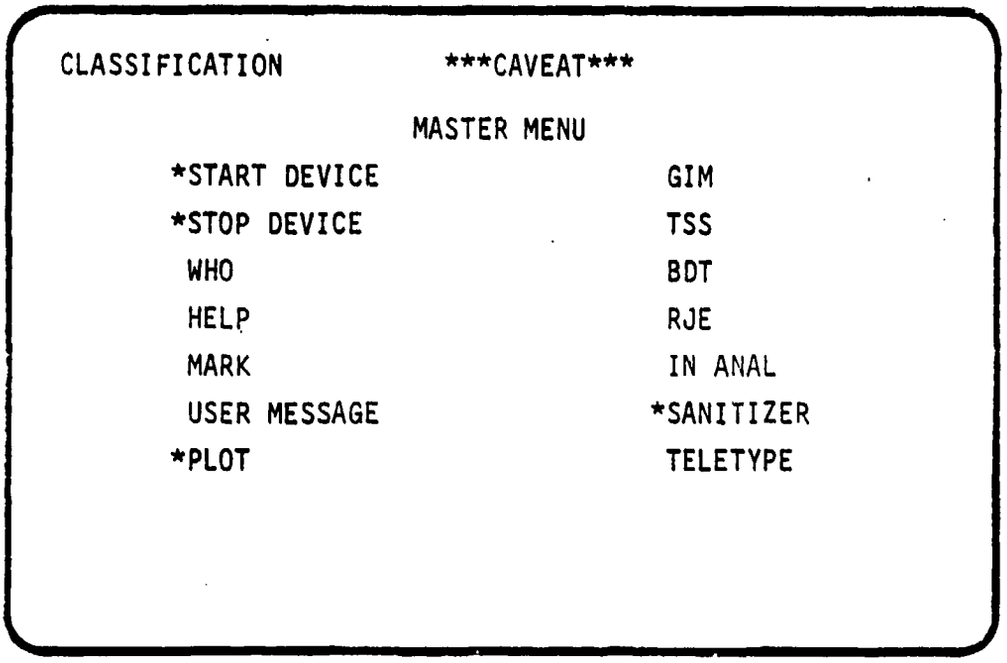


Figure 6. General Structure of IISS Functional Capabilities



*Restricted options

Figure 7. Master Menu of the IISS. Redrawn from *IISS User's Manual*, p. 3-5.

HUMAN-COMPUTER INTERACTION MODES

Man-Machine Interface (MMI) Mode

The computer enters the MMI mode automatically whenever the user/operator selects any MASTER MENU option except TELETYPE or GIM-II. It also enters this mode automatically if the user/operator selects GIM, signs onto a data base, and then selects UTM/GEO, REPORTW, ANALYSIS, or INPUT from the GIM-II MENU (Figure 6 illustrates this progression; the GIM MENU is illustrated in Figure 8). However reached, the MMI mode provides preformatted displays to assist the user/operator in constructing command statements to perform the functions available in this mode. Each display consists of field labels to identify the input requirements of the function; each field label is followed by a series of underlined blank characters to indicate the maximum number of input characters. At the bottom of the screen, the computer displays a list of "switches" that are associated with the function. These switches are optional software parameters; if the field label is taken as the verb of a command statement, then the switches are the parameters used to complete that statement.

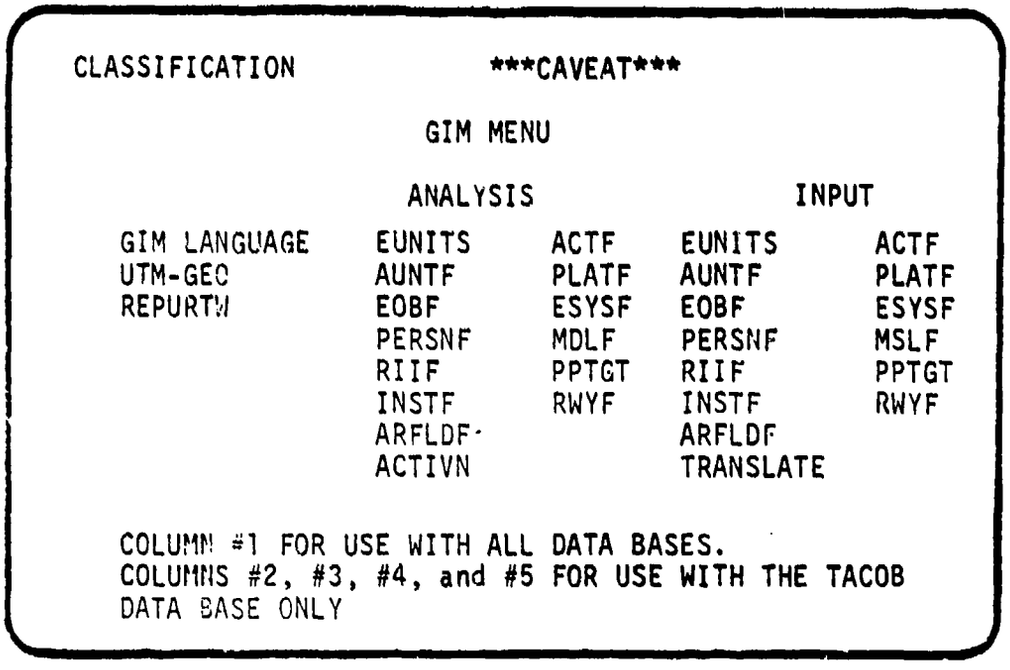


Figure 8. GIM-II Menu on the IISS. Redrawn from *IISS User's Manual*, p. 3-36.

Figure 9 illustrates a completed MMI Preformatted display, in this case a Bulk Data Transfer (BDT).

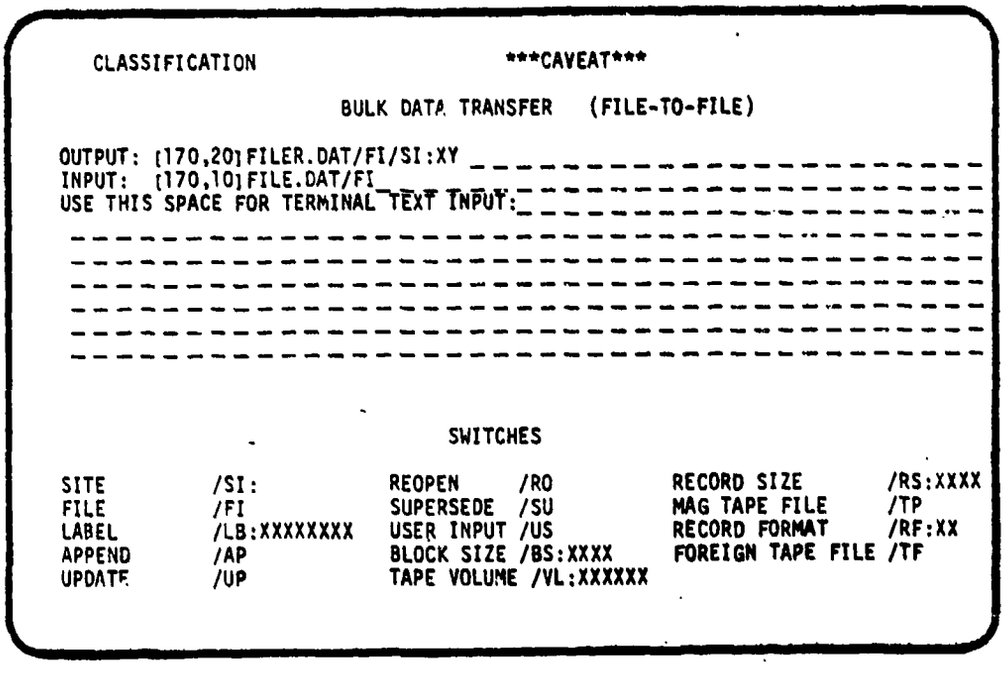


Figure 9. Preformatted Display for the Bulk Data Transfer (BDT) in the IISS MMI Mode. Redrawn from *IISS User's Manual*, p. 3-15.

The required fields for a BDT are OUTPUT and INPUT; the remaining field provides space for optional text entry. To complete the OUTPUT field, the user/operator first enters a code to designate the source storage location (this code is (170,20) in Figure 9). Next, a file name and catalog are entered to designate the data to be transferred (FILER.DAT in this example. Note that these two information items are not prompted; the user/operator must retrieve them from memory or from an off-line source. Then, the switches list may be consulted to find the code for a disk file (/FI) or a magnetic tape file (/TP; other codes are provided to assist with entry of block size, record size, record format and other tape file characteristics). Then, the destination of the data to be transferred is indicated by entering /SI followed by a site code (XY) in the example. A similar procedure is followed to complete the INPUT field.

The BDT is one of the simplest examples of the MMI mode of interaction (WHO and HELP--Figures 10 and 11 respectively--are even simpler, consisting merely of lists of information with no further input required). Other pre-formatted displays contain more explicit prompting information (e.g., the PLOT control data format, Figure 12. However, these more detailed displays

CLASSIFICATION ***CAVEAT***

USER STATUS REPORT

USER	ORG	DEV	UNIT
TOM	TRW	TT1	2.
CINDY	TRW	UC5	18.
ESPIE	TRW	TT4	5.
DOUG	TRW	TT3	4.

Figure 10. User Status Report, Output from Selecting WHO Option on the Master Menu. Redrawn from *IISS User's Manual*, p. 3-7.

either are reserved for specially trained personnel (e.g., restricted options such as PLOT), or have not yet been implemented (e.g., the Full Record Display for air units task in the ANALYSIS function), according to available

```
CLASSIFICATION

   HELP -- HELP OPTION (SHORT/LONG MISSING LONG DEFAULTED)
   OPTION          DESCRIPTION
   BDT             BULK DATA TRANSFER -
   COPY            COPY INPUT TO OUTPUT
   DSPLY           DISPLAY VERB ENTRY POINT FROM MENU
   GIM             GENERALIZED INFORMATION MANAGEMENT
                     SYSTEM (LOCAL)
   HALT            LOGOFF AND HALT TERMINAL
   HEADER          ALTER SECURITY HEADER
   HELP            USER OPTION LIST
   LOGOFF          LOG OFF
   MSG             SEND MESSAGE TO USER LOCAL OR REMOTE
   NOTE            COMMENTS, NO OPERATION
   PRINT           PRINT VERB ENTRY POINT FROM MENU
   RJE             REMOTE JOB ENTRY
   SCRTCH          SCRATCH VERB ENTRY POINT FROM MENU
   START           START DEVICE
   STOP            STOP DEVICE
   TSS             TIME SHARING ON THE H-6000
   WHO             USER STATUS REPORT
```

Figure 11. The List of Function Descriptions Resulting from Selection of the HELP Option from the Master Menu. Redrawn from *IISS User's Manual*, p. 3-8.

documentation. Regardless of the detail in the display, after the user/operator finishes entering data, pressing the SEND key transmits the completed display to the computer for processing (in the case of WHO and HELP, the user/operator presses another key to return to the MASTER MENU).

Teletype Mode

Selecting TELETYPE on the MASTER MENU causes the computer to enter the TELETYPE mode. Human-computer interaction is carried out in this mode in a command language much like that employed with the monitor of the PDP 11/70.

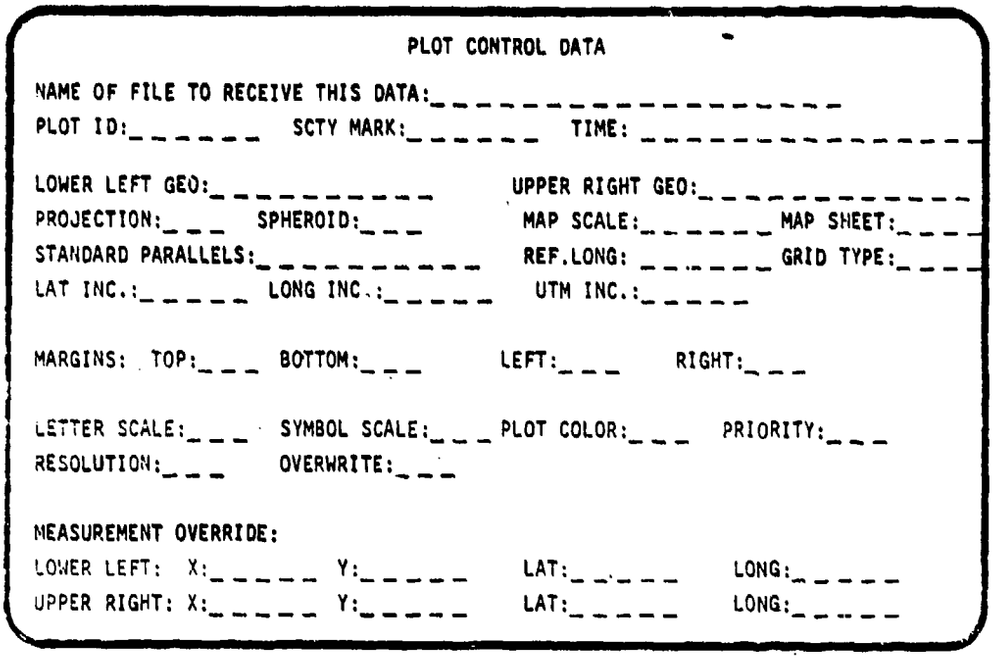


Figure 12. The Control Data Display of the PLOT Function in the MMI Mode. Redrawn from *IISS User's Manual*, p. 3-48.

In TELETYPE, the computer does not provide preformatted displays incorporating the prompts that are available in the MMI mode. Instead, the user/operator keys in command verbs and parameters from memory or off-line references, without benefit of field labels, underlines to indicate field lengths, or lists of appropriate switches.

Figure 6 shows that at least nine of the sixteen functions available in the MMI mode are also available in TELETYPE, although the interaction methods differ. Available documentation suggests that the MARK function in MMI and the HEADER function TELETYPE are highly similar functionally, if not identical. Whether PLOT and IN ANAL are available in TELETYPE as well as MMI is not clear. However, the documentation does indicate that DSPLY, APP, COPY, UPWIC, and SCRATCH are available only in TELETYPE (these and other IISS functional software capabilities are discussed in Appendix D).

The user/operator at an SU 1652 terminal has the option of using either MMI preformatted displays or TELETYPE command statements to execute functions common to both modes. Thus TELETYPE is available as a backup in the event of partial failure of the terminal, for example in the light pen. Also, TELETYPE must be used by ASSIST users/operators who wish to use IISS capabilities but do not have an SU 1652 terminal. And, of course, TELETYPE must be used for those functions listed above that are peculiar to this mode.

GIM-II Language Mode

As noted earlier, most of the functions executed in the MMI and TELETYPE modes may be viewed as "utility" functions. That is, they relate to configuring the system, obtaining user lists, reviewing available functions or the contents of output queues, transferring data, exchanging information with other users, and the like. A primary function of IISS, however, is to support analyst interactions with intelligence data bases. These interactions are performed in the GIM-II mode.

After logging on, the user/operator can select GIM-II from the MASTER MENU. The next step is to sign onto one of the system's data bases, currently TACOB (this and other data bases are discussed in Appendix E). After completing the sign-on procedure, the computer displays the GIM-II MENU. Figure 6 shows that selecting any of four options on this menu will lead to the MMI mode, where the user/operator can fill out the appropriate preformatted display. Selecting the fifth option will lead to the GIM-II Language mode. The GIM-II Language is essentially a data base management system; like the TELETYPE mode, it uses command statements rather than preformatted displays. The major differences between the two modes are in the functions available in each, and in GIM-II's more extensive vocabulary. Of course, the user/operator can reach GIM-II through the TELETYPE mode, as shown in Figure 6. In fact, this appears to be the only mode change that can be made without first returning to the MASTER MENU.

ANALYSIS OF TRANSACTION FEATURES

Project personnel analyzed IISS by means of two primary methods: document reviews and interviews with subject matter experts. In both methods, personnel recorded their observations using a Transaction Feature Analysis technique developed by Synectics for this purpose. Table 2 describes the elements of this technique.

The Transaction Feature Analysis technique is useful in guiding the analyst to detect and describe desirable, as well as undesirable, design features affecting user/operator transactions. In the case of desirable features, the technique can capture lessons learned from one system that will be relevant to other, perhaps future, systems. In this way, the technique can help to overcome the problem of information transfer among systems. Of course, when describing a desirable feature, the analyst enters a uniform notation for Recommended Resolution: "None required."

Transaction features analyzed with the technique are organized according to the categories shown in Table 3. Results of the analyses are discussed in the same order; the individual analyses are presented in Appendix A.

1. CONTROL METHODS

Control methods are the methods by which the user/operator controls the sequence of execution of system functions. Using control methods, the user/operator instructs the computer which functions to perform, and in what order.

1.1 Command Language

For the purpose of this effort, project personnel define command language as the syntax and vocabulary of system control instructions that are entered into the computer as statements composed of words, abbreviations, or codes (commands) and appropriate parameters. Most typically, such statements are entered by typing at a keyboard. Applying this definition, IISS users are exposed to at least four different command languages:

1.1.1 GIM-II Language. This is the most important IISS command language, since detailed knowledge of this language allows the user to perform

Table 2

Description of the Transaction Feature Analysis Technique

Transaction Feature.	The analyst describes the type of transaction being analyzed.
Description.	The analyst describes how the feature works in system operations. The description includes a specific example of the feature in straightforward, operational terms.
Behavioral Implication.	The analyst describes the feature's impact on the user's/operator's performance. The description includes what the individual must do--and must not do--in using the feature. It also includes requirements imposed upon the user/operator in terms of memory burden, error likelihood, skill requirements, and/or other performance-related issues.
Transactional Implication.	The analyst describes the feature's effect on the system's processing operations. The description includes issues such as the system's ability to detect errors, its error handling procedures, and/or the time required to complete transactions.
Consequences.	The analyst describes the feature's impact on overall system performance. Here, the analyst predicts the answers to questions such as the following. What effect does the feature have on the accuracy and timeliness of the data base? What effect does the feature have on the quantity and and quality of output? Will the commander's picture of the battlefield be enhanced or distorted? Will targets be fired more quickly, or lost?
Recommended Resolution.	The analyst describes specific, detailed remedial action. These recommendations include changes to hardware, software, or procedures that will improve system performance.

Table 3

Categories of Design Features Affecting User/Operator Transactions with Battlefield Automated Systems

1. CONTROL METHODS
   - 1.1 Command Languages
   - 1.2 Menus
   - 1.3 Function Keys
   - 1.4 Hybrid Methods
   - 1.5 Prompts/HELPS
2. DISPLAY FORMAT
   - 2.1 Fixed Alphanumeric Displays
   - 2.2 Variable-Length Alphanumeric Displays
   - 2.3 Graphic Displays
   - 2.4 Highlighting
3. DATA ENTRY AND HANDLING
   - 3.1 Information on Legal Entries
   - 3.2 Unburdening of Input
   - 3.3 Interrupts and Work Recovery
   - 3.4 Manipulating Stored Data
4. MESSAGE COMPOSITION AIDS
   - 4.1 System Design Features
   - 4.2 Format for Alphanumeric Messages
   - 4.3 Graphic Messages
5. DATA RETRIEVAL ASSISTANCE
   - 5.1 Query Method
   - 5.2 Query Structure
6. GLOSSARIES
   - 6.1 Standard Terms
   - 6.2 Character Sets and Labels
   - 6.3 Glossary Availability and Use
   - 6.4 Abbreviation and Coding
7. ERROR HANDLING
   - 7.1 Prevention
   - 7.2 Detection
   - 7.3 Feedback
   - 7.4 Correction/Recovery
8. USER/OPERATOR CONFIGURATION
   - 8.1 Operator(s) Only
   - 8.2 Operator(s) and User(s)
   - 8.3 Combined User/Operator
   - 8.4 User and Operator Chains

virtually all IISS functions. The GIM Language is quite powerful, albeit somewhat complex for relatively naive users. GIM-II verbs, qualifiers, system literals, and connectives are listed in Appendix F. Their functions are:

1. Verbs indicate to the system exactly what activities are to be performed.

2. Qualifiers identify under what conditions certain activities are to be performed. Conditional situations may be defined mathematically, list-positionally, logically, or in combinations.

3. System literals identify values (defined as literals) which are necessary for system operation.

4. Connectives bridge terms and phrases in GIM-II commands, defining how they should be combined in order to reach the desired result.

1.1.2 Man-Machine Interface Option Switches. These switches form a type of "command language" in that they define certain operations to be performed when used in particular situations. The switches are a relatively "syntax-free" command language, since they are used in essentially the same way in almost all situations. Some of the switches require that values be associated with the switch, requiring that the user learn a rudimentary syntax. The option switches are not command-language like in that the form of the switches (and terse indications of switch meaning/function) appear in the working displays on which they can be used. A listing of the IISS option switches and their functions appears in Appendix G.

1.1.3 Honeywell TSS Command/Monitor Language. When employing the IISS TSS option, the user must be familiar with the Honeywell H-6ØØØ command syntax and structure. This command language is not, strictly speaking, an IISS command language--it may be used by IISS anlaysts only because IISS permits connection to the EUCOM AIDES H-6ØØØ. The ARI/Synectics review did not include the TSS command language; it will not be discussed further here.

1.1.4 Honeywell H-6ØØØ Batch JCL. When employing the IISS RJE option, the analyst must have some knowledge of the H-6ØØØ batch JCL, which is a form of command language. As with TSS, this language is not really an IISS feature. Rather, it is a feature of the H-6ØØØ in its EUCOM AIDES manifestation. Since the ARI/Synectics review did not include the Honeywell batch JCL, it will not be discussed further here.

1.2 Menus

IISS uses two general types of menus:

1.2.1 Light Pen Selection Menus. These are menus which are presented to the user which require him/her to light pen a desired option. There are essentially only 2 such menus used in IISS--the MASTER MENU (see Figure 7) and the GIM MENU (see Figure 8). These are menus in the classic sense. The user must either select an item from the menu, or perform some other function which supersedes or overrides the menu selection process (e.g., press a fixed function key; press a variable function key).

1.2.2 Option Switch Lists. The presence of the option switch lists are present on a variety of IISS command forms (e.g., bulk data transfer (BDT) form (Figure 9); remote job entry (RJE) form (Figure 13). While these forms represent what is basically a "form filling" approach to the control of IISS operations and processing, the inclusion of the option switch lists provide a form of menu. The user need merely survey the option switch lists to identify the switch form required for the desired operation, and enter it into the appropriate place on the form.

The appearance of menus in IISS bespeaks an appropriate concern on the part of the system designers for the memory burden being imposed on the analyst-users of the system. Menus reduce the number of command codes which must be committed to memory. They thus reduce the opportunity for users to misremember and enter erroneous commands they also reduce the amount of time required for users to look up appropriate commands in reference documents.

There are some deficiencies in the way in which menus are used (and not used) in IISS:

1. The light pen is used in only two of the menus in IISS. The need for users/operators to transfer from light pen interaction to keyboard interaction to guide IISS processing is not the most efficient form of interface possible. Either the light pen should not be used, or some alternative to its use provided.

2. There are a number of command functions in IISS where the use of menu-driven interaction would be more convenient than the method currently used.

3. The information which does appear on IISS menus is often needlessly terse.

1.3 Function Keys

Both fixed and variable function keys form important components of the overall IISS command mechanism. The layout of function keys on the SU 1652 terminal keyboard is shown in Figure 4. Note that the fixed function keys are contained in three groupings, while the variable function keys are contained in two separate groupings. The two separate types of functions are distinguished not only by position, but also by general command function.

```
CLASSIFICATION                    ***CAVEAT***
                                  REMOTE JOB ENTRY

OUTPUT: _____________________________________
INPUT:  _____________________________________
DATANET ID: _________________________________

                                  SWITCHES

*FILE          /FI              *BLOCK SIZE          /BS:XXXX
*LABEL         /LB:XXXXXXXX     *TAPE VOLUME         /VL:NNNNNN
+APPEND        /AP              *RECORD SIZE         /RS:XXXX
+UPDATE        /UP              *RECORD FORMAT       /RF:XX
*REOPEN        /RO              *MAG TAPE FILE       /TP
+PRIORITY      /PR:A            +SPOOL TO PRINT      /SP
+SUPERSEDE     /SU              *FOREIGN TAPE FILE   /TF



+OUTPUT ONLY
*ALLOWABLE FOR OUTPUT AND INPUT
```

Figure 13. Remote Job Entry Form. Redrawn from *IISS User's Manual*, p. 3-17.

1.3.1 Fixed Function Keys. These keys control highly terminal-oriented functions, such as those required for text editing (on the screen of the SU 1652), those indicating that the user is ready to send information from the SU 1652 to the main IISS processor, and those involved in selecting between the SU 1652 dual display screens. These functions depend heavily on the processing capability of the SU 1652. The fixed function keys are always "active;" that is, their associated functions will be enabled at any that the key is pressed.

1.3.2 Variable Function Keys. These keys control IISS activities which have more to do with the processor (AN/GYQ-21(V)) than the terminal. The SU 1652 processor must, of course, evaluate the key pressed and generate the correct series of codes to be sent to the processor. In general, however, its role is merely one of formatting and communication. The terminal itself takes no action that is immediately evident to the user.

In its IISS implementation, the variable function keys are "variable" only in that they are not always active. The actual function of any particular key is constant, assuming that it is active. The function of the key will not change during IISS operations. It should be noted, however, that--unlike the situation with fixed function keys--the action of the variable function keys can be changed via terminal and system reprogramming.

The function of the variable function keys is not labeled on the key itself, but rather on the transparent underlays placed beside each "strip" of keys. There are lights under each key label cell. When the function is active, the light under the corresponding key label cell is lit.

A list of fixed function key operations is provided in Appendix B; an analagous list for variable function keys appears in Appendix C.

The extensive use of function keys in IISS has several benefits:

1. It provides a source of constant "prompts" for IISS users, since the key labels are imprinted on the keys or written in the key label cells. This reduces the memory burden on the users.

2. It assures that terminology associated with particular functions will be consistent. Since the labels are consistent, programmers maintaining or updating the system cannot mistakenly introduce terminological inconsistency.

3. The way in which the variable function keys are implemented in IISS is particularly useful in reducing user memory burden. Some implementations merely label VFKs with numbers, requiring either that:

   a. The users remember what functions are associated with a specific variable function key number.

   b. A menu be presented on the screen indicating what VFK is to be pressed to perform a particular function. Not only does this method burden system main and peripheral memory resources, but it also requires that the user split attention between keyboard and screen.

   The IISS implementation has neither disadvantage.

There are, however, ways in which the employment of function keys could be made efficient in IISS, particularly for novice users/operators:

a. IISS displays should indicate to the user/operator what function keys (fixed or variable) are typically used in conjunction with the operations to which the displays refer.

b. Where the list of function keys and the explanation of their effects are too lengthy to place on system displays, a "HELP FUNCTION KEYS" VFK could present to the user the list of the function keys active at the current point in IISS operations.

c. Labels on the VFKs should be more informative--there is certainly room in the VFK labels areas for more text. More informative labels would not degrade the performance of experienced users/operators, but would make the system easier to use by less sophisticated individuals.

1.4 Hybrid Methods

The wide variety of command methods available in IISS virtually assures that some hybrid methods will be employed. The most significant and pervasive combinations employed in IISS are:

1.4.1 Combination of Form Filling, Menu, and Fixed Function Key Methods. Using the MMI forms to control IISS operations requires that all three of these methods be employed:

1. Form filling is the core command method, since codes must be entered into the MMI forms to define subsequent processing operations.

2. Menu selection is used to provide the list of "switch" commands which may be used to complete the forms. This aspect of the command is advantageous since it obviates remembering the "switch" command language.

3. Fixed function keys are used to position the screen cursor in the appropriate field for switch entry.

1.4.2 Combination of Light Pen Menu Selection and Fixed Function Key Methods. When the MASTER MENU and the GIM MENU are used in IISS, the user first uses the SU 1652 light pen to select the desired option. The user must then press the SEND key to transmit the selection to the main IISS processor.

1.4.3 Use of Variable Function Keys Throughout IISS Operations. The highly flexible variable function key configuration of the SU 1652 allows it to be used in IISS when a variety of other command methods are being employed. In many such circumstances, the variable function keys form a constantly available set of "global system options."

1.5 Prompts/HELPS

There is only one HELP display contained in IISS (see Figure 11). This display is accessed through the IISS MASTER MENU, or through the HELP command when the TELETYPE option of IISS is employed.

The availability of prompts within IISS differs with the operating mode being employed. Some "prompt" information is always presented--the labels on the FFKs and the illuminated labels associated with the VFKs. When the MMI forms and menus are being used, there are a variety of types of prompts, including:

1.5.1 The Labels on the Interactive Forms, which indicate what information should be entered into the "blanks" on the forms.

1.5.2 The "Switch" Lists, indicating what options are legal for a given form.

1.5.3 Menu Contents, which present the available, legal options for the MASTER MENU and the GIM MENU.

When in the GIM LANGUAGE mode, IISS prompts are much less informative. The available IISS documentation alludes to an "input form" associated with the GIM LANGUAGE mode. No example of this form appears in the documentation, so no comment about the value of the form as a prompt can be made.

When in TELETYPE MODE, the usual prompt available is "MNU>," indicating that the user is in TELETYPE mode and is waiting for a response. For some of the TELETYPE options, some more detailed prompts are available:

1.5.4 APP Option. After the APP option is selected in TELETYPE mode, the system responds with the following prompt:

```
WELCOME TO THE APPLICATION TEST.
ENTER A PASSWORD.
```

After the password entry, more prompt information is presented:

```
YOU HAVE PASSED GO.  COLLECT $2ØØ.  (sic)
ENTER A STRING AND IT WILL BE ECHOED.
ENTER 'BYE' TO TERMINATE.
ENTER 'WAIT' TO SUSPEND FOR 1Ø SECONDS.
```

The input prompt appearing in the APP option is:

```
APP>
```

1.5.5 COPY Option. When the COPY option is selected from TELETYPE mode, the prompt associated with this option is:

```
COP>
```

There may be prompts available from the TSS and RJE options of IISS, but these would be generated by the EUCOM AIDES Honeywell H-6ØØØ. Since the project team did not have an opportunity to review EUCOM AIDES characteristics in detail, and since EUCOM AIDES is not really a "subsystem" of IISS, no further comment will be made on TSS and RJE prompts.

The lack of detailed help information is one of the most glaring deficiencies of the IISS. There is virtually no information on legal entries, command and data entry code and abbreviation glossaries, command syntax, functions of the IISS, or the meaning of terminology used in IISS displays and prompts. This kind of information should be available on-line to IISS users/operators.

Prompts in IISS are plentiful, although they are not always as informative as they might be. More detailed prompts should be provided for IISS capabilities which are not likely to be used often, such as the JINTACCS message creation function (IN ANAL).

2. DISPLAY FORMAT

2.1 Fixed Alphanumeric Displays

The dual 8Ø column by 24 line screens of the SU 1652 provide a great deal of flexibility in creating alphanumeric displays. The "screen area" organization of the displays does, however, somewhat constrain the available display space. The fixed alphanumeric displays appearing in IISS are listed in Table 4.

IISS fixed format alphanumeric displays are generally well organized for readability. There are, however, two exceptions to this general rule:

1. Individual TACOB fields are often not organized for maximum readability. In particular, geographic coordinates, UTM coordinates, dates, and times should be broken into subfields for display.

2. Where display space is not at a premium, both the labels of TACOB record elements and the contents of those elements should be expanded to increase meaningfulness. A field currently labeled RRDAT, for example, might be translated for the user/operator to read READ. RATE DATE or READINESS RATING DATE. This approach will be particularly useful where:

   a. Users/operators have not had time to gain significant experience in the use of IISS.

   b. Functions are used rarely (e.g., IN ANAL).

Table 4

IISS Fixed Alphanumeric Displays

TYPE/NAME OF DISPLAY	EXAMPLES	COMMENTS
MASTER MENU	Figure 7	Fixed display for an individual type of user. Where an option is not valid for a particular type of user the associated menu term is not displayed. This prevents the user from entering an illegal command.
GIM MENU	Figure 8	Fixed display for an individual type of user. Where an option for input is not valid for a particular class of user, this option is not displayed. This prevents the user from entering an illegal command.
MMI FORMS	User Message Form (Figure 14) TSS Form (Figure 15) RJE Form (Figure 13) BDT Form (Figure 9)	This class of forms is quite consistent in format, containing labels for fields into which option switches or free text information should be entered. Most forms request INPUT and OUTPUT definition.
CLASSIFICATION HEADER	Figure 5	Contains the classification and caveat associated with the terminal session Not alterable by user. Appears in screen and screen area 4 for right screen.
JINTACCS FORMATS	Figure 16	Input formats for creation of JINTACCS formats. Consistent in format; follows the JINTACCS format conventions.
INDEX LISTS	Figure 17	Contains the information on "hits" of TACOB retrievals. Presented in fixed format although length of the index lists is variable (i.e., depends on the number of hits in the retrieval). Available documentation does not indicate whether content of index list is variable.
LOGON FORM	Figure 18	Constant input-prompt format.
SYSTEM STATUS	Figure 5	Appears in screen area 6.
FULL RECORD DISPLAY (INPUT)	Figure 19	Used to input information into TACOB data bases. Where user has no valid input, user simply does not enter information.

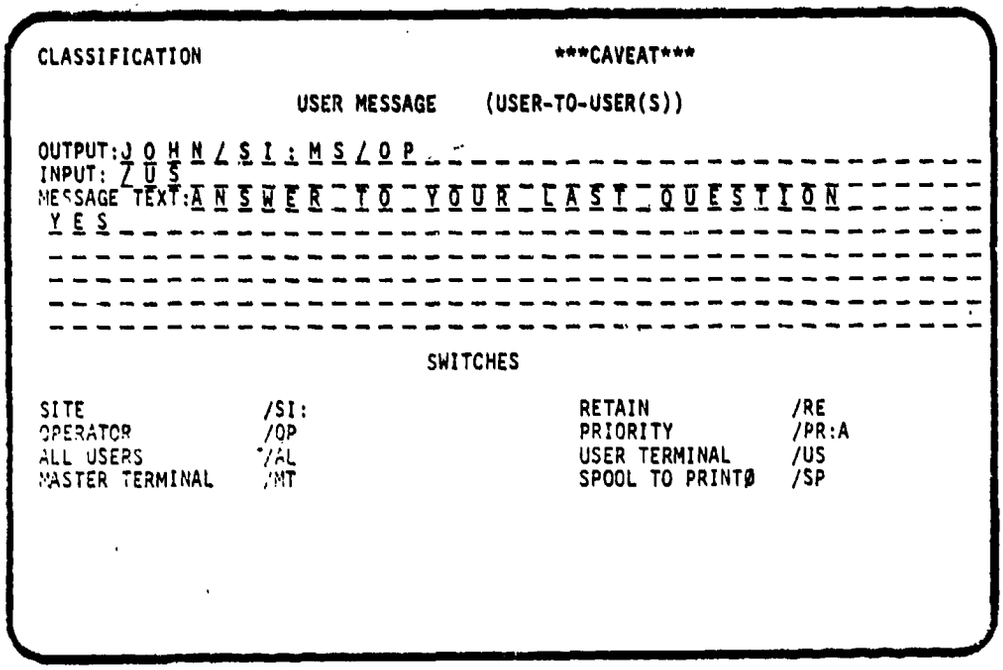


Figure 14. Examples of User Message Form. Redrawn from *IISS User's Manual*, p. 3-10.

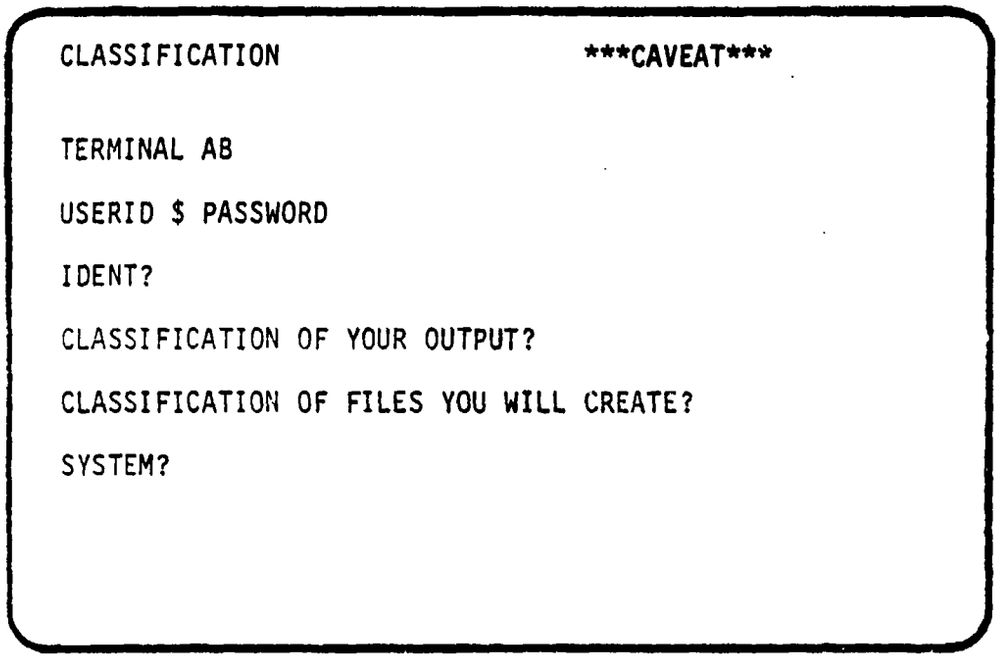
2.2 Variable-Length Alphanumeric Displays

There are essentially three types of IISS displays which can be thought of as true variable-length alphanumeric displays.

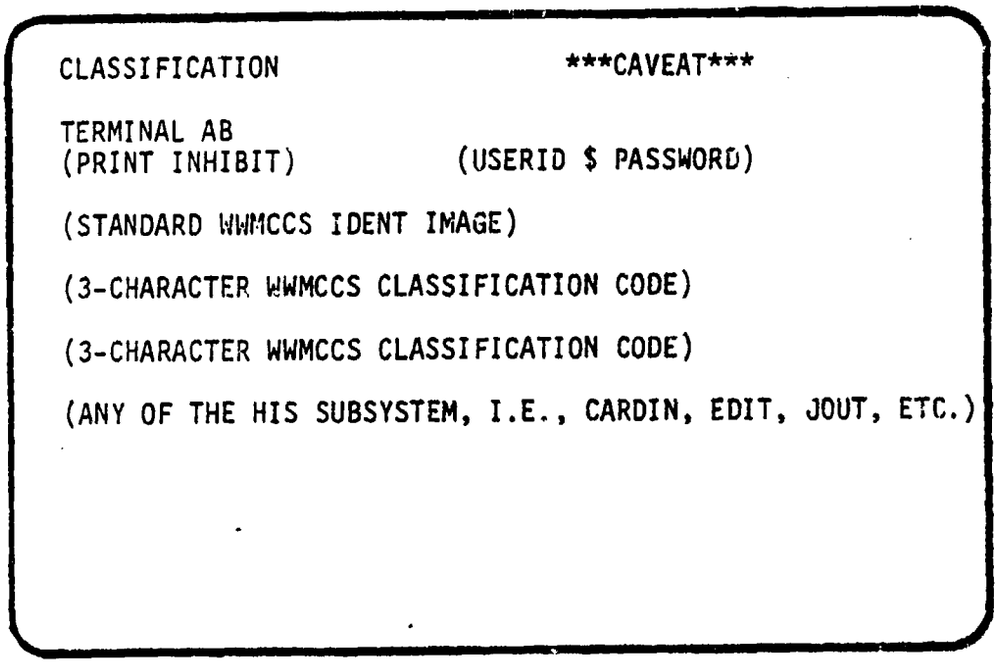
2.2.1 User Messages. Since the main content of user messages is in free text, they are highly variable in length and format. The user is completely free to format information in any way consistent with the limitations of the IISS hardware and software. (See Figure 14.)

2.2.2 REPORTW Output. If the user wishes to generate a set of information from a TACOB data set in a format of his/her choosing, the reportwriter (REPORTW) option must be employed. This option provides considerable flexibility in organizing information for display; it is inappropriate, therefore, to comment upon the organization or sensibility of the formats thus obtained.

2.2.3 Output Using the GIM LIST Verb. Using the GIM language, the IISS user can indicate that a specified subset of the information is contained in a TACOB data base. Unless such output is under the control of a report formatting option, the format of output is not controlled by the user.



Left Screen - TSS Prompts



Right Screen - User Entries

Figure 15. Time Sharing System (TSS) Displays of the Host H-6ØØØ Operating System. Redrawn from *IISS User's Manual*, pp. 3-12, 3-13.

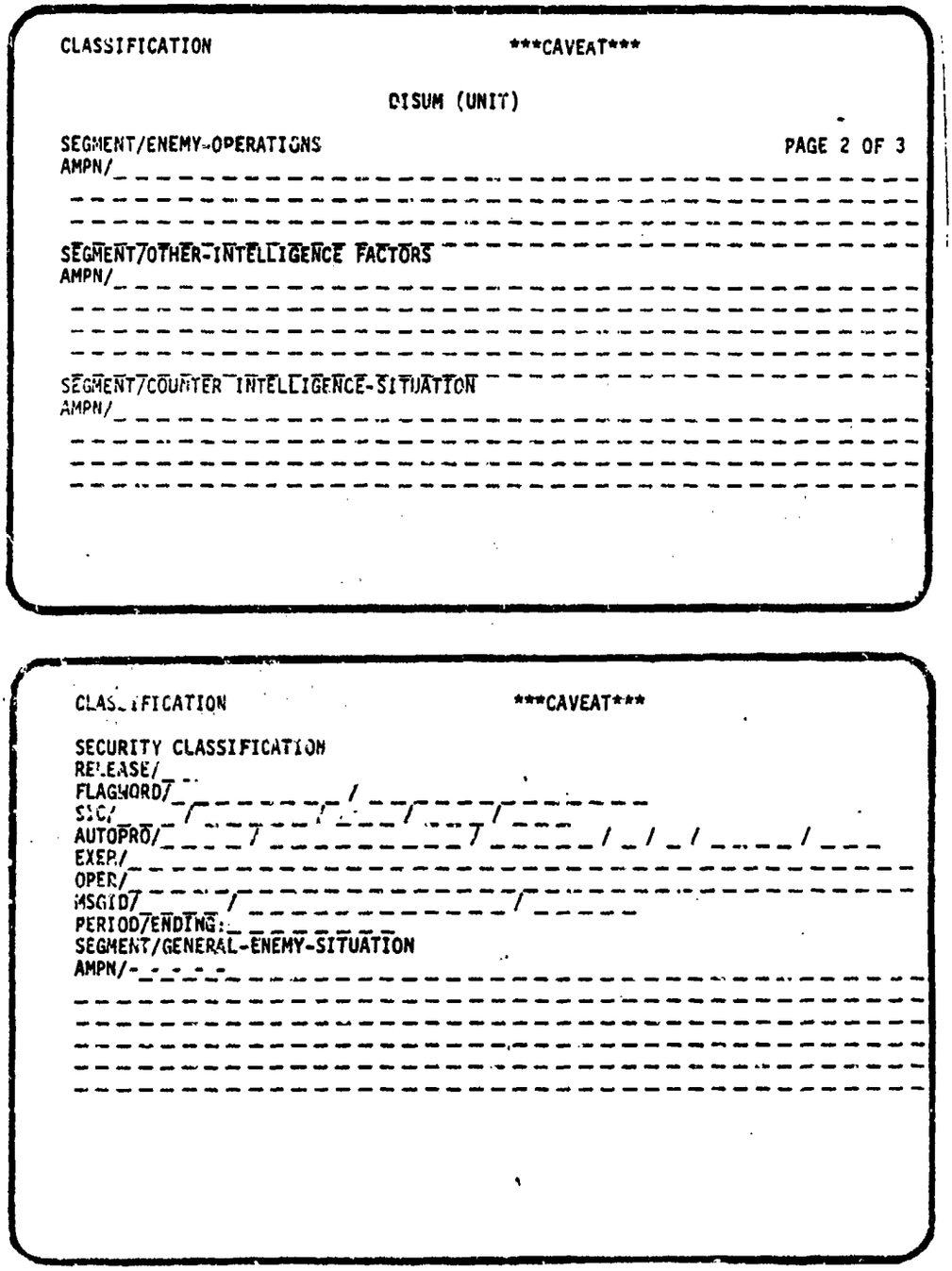


Figure 16. JINTACCS Format Example. Redrawn from *IISS User's Manual*, p. 3-22.

CLASSIFICATION ***CAVEAT***

SHORT OUTPUT SCREEN FOR AIR UNITS (AUNTF)

AUNTF		EQATH	EQPOH	ACFTF	PRTOT	PHTOT	CALEG
AUNIT00002	I AIRUNIT03	2	49	ACFT	156	0	IT
AUNIT00003	I AIRUNIT04	3	48	ACFT	160	0	IT
AUNIT00004	I AIRUNIT05	4	47	ACFT	164	0	IT
AUNIT00006	I AIRUNIT07	6	45	ACFT	172	0	IT
AUNIT00007	I AIRUNIT08	7	44	ACFT	176	0	IT
AUNIT00008	I AIRUNIT09	8	43	ACFT	180	0	IT
AUNIT00009	I AIRUNIT10	9	42	ACFT	184	0	IT
AUNIT000010	I AIRUNIT11	10	41	ACFT	188	0	IT
AUNIT000011	I AIRUNIT12	11	40	ACFT	192	0	IT
AUNIT000012	I AIRUNIT13	12	39	ACFT	196	0	IT
AUNIT000013	I AIRUNIT14	13	38	ACFT	200	0	IT
AUNIT000014	I IARUNIT15	14	37	ACFT	204	0	IT
AUNIT000015	I AIRUNIT16	15	36	ACFT	209	0	IT
AUNIT000016	I AIRUNIT17	16	35	ACFT	212	0	IT

Figure 17. Index List for Air Units File

IISS LOGON

USER ORGANIZATION: JOSAC _ _ _ _ _

USER NAME: TOM _ _ _ _ _ _ _ _ _ _ _ _

USER PASSWORD: _ _ _ _ _ _

Figure 18. Completed IISS LOGON Form.

```
                    INPUT-OUTPUT SCREEN FOR AIR UNITS (AUNTF)

                                                              PAGE 1 OF 3

 IAIRF     ID AVMIT0@@@2              EFUNC (2)
 RECLS (6)  AAAABB                    AFDID(16) 8@@27*1234-@@@24
 OLDAT(11)  77@527                    PLCTR(13)
 ECHLV (4)
 IAIRU(10)
 ORTHM(76) AIRUNIT02
 PUNIT(76) AIRUNIT83
*ALTNM(76)
 ALTNAME02

*SUNIT(76)
 AIRUNIT@4

*MULTI-VALUED FIELD, SEPARATE WITH COMMAS.
                        AFLDF
```

Figure 19. Full Record Display

```
                                        AUNTF (CONT)          PAGE 2 OF 3
+PRAFD(16) @@@1*1234-@@@@2

+PLDAT(11) 77@226
+ACTID(39)

*RMKEY (5)

*RMARK(8@)
 1*AAAABB*THIS IS THE FIRST AIR UNIT REMARK
 2*AAAABB*THIS IS THE SECOND AIR UNIT REMARK

*MULTI-VALUED FIELD, SEPARATE WITH COMMAS.  +CANNOT BE DIRECTLY UPDATED.
```

Figure 19. Continued.

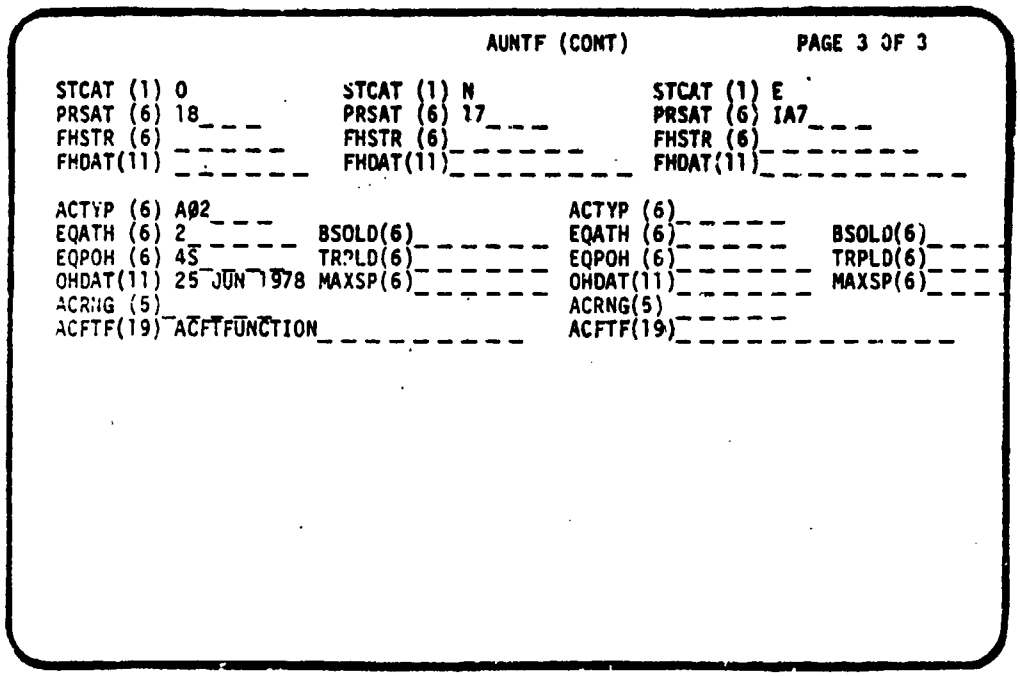


Figure 19. Continued.

Variable-length alphanumeric displays are generally well organized and readable. Three improvements might be made:

1. Provision of a screen printer colocated with the GOB analysts who will be using the system. This will facilitate use of listings which do not fit on a single SU 1652 display screen.

2. Provision for more facile column justification and positioning control in report formats which are defined by the users/operators (i.e., use of the REPORTW function).

3. Provision for user control of the INDEX listing to accommodate to individual user/operator requirements for "quick-scan" item review displays.

2.3 Graphic Displays

No true graphics or pseudographics (i.e., graphics constructed from characters) are available at the SU 1652 terminal. Geographically-oriented plots are available using the PLOT option, but this option is not currently implemented for IISS analyst users. These plots must be performed with the assistance of highly skilled system operators. Plots are made on a Calcomp flatbed plotter. The ARI/Synectics review team did not have an opportunity to assess plotter formats or symbology.

The addition of a graphics display capability would be a welcome addition to IISS, particularly in configurations where the users/operators are physically removed from the IISS vans/shelters. IISS work stations should be equipped with digitizing tablets or pads to fulfill the potential of CRT graphics implementations.

2.4 Highlighting

The SU 1652 has a number of features which could be employed to highlight important information, including brightness control, reverse display, and blinking. IISS does not, however, use any of these forms of highlighting.

3. DATA ENTRY ASSISTANCE

3.1 Information on Legal Entries

IISS provides relatively little information on the required format or content of legal entry information. Legal entry information which is provided appears in the form of:

3.1.1 Formatting Information. Where the user must provide input of a specific length, IISS input forms often contain information on the number of characters which should be entered. This indication is given in the form of "underlines" associated with a given input field.

3.1.2 Legal Value Listing Where the Number of Categories is Extremely Small. For example, when the user indicates a desire to terminate generation of a JINTACCS format while in IN ANAL mode, the END-INPUT ANALYSIS form is displayed (Figure 20).

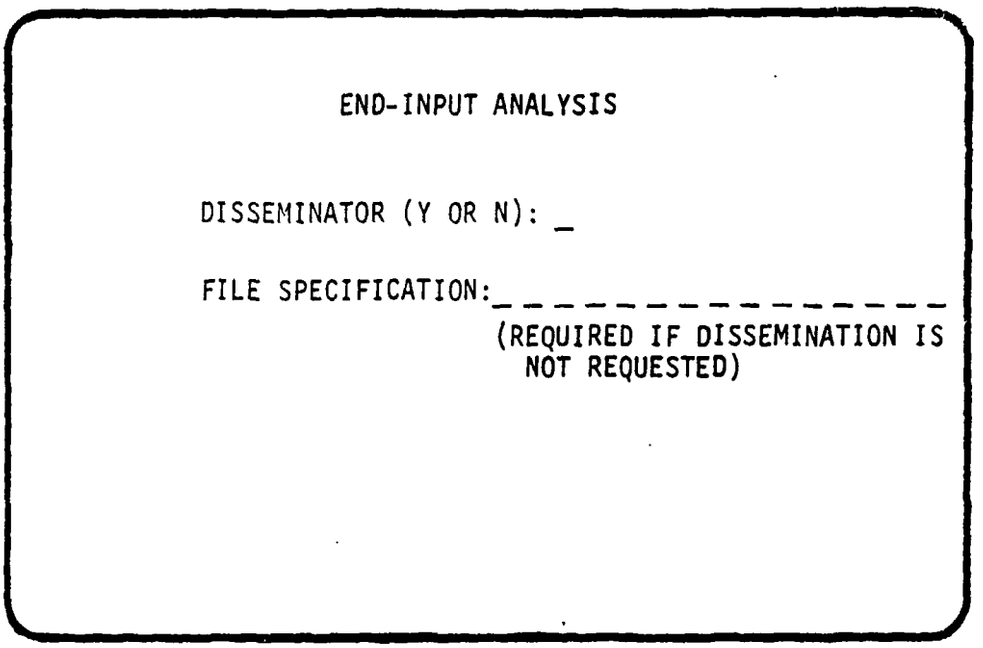


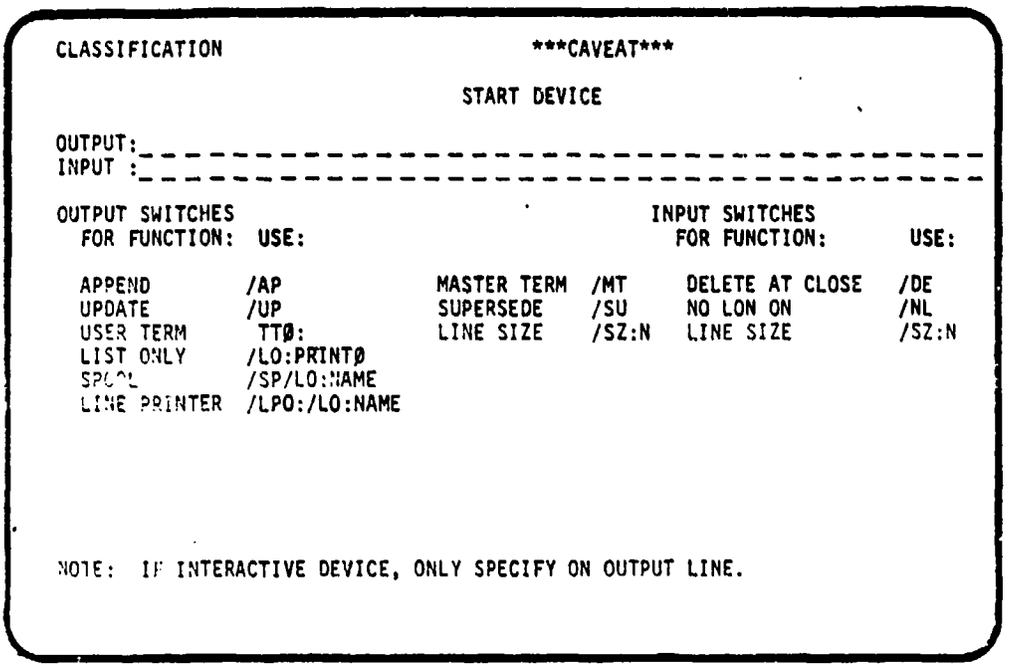
Figure 20. End-Input Analysis Form. Redrawn from *IISS User's Manual*, p. 3-21. Note that the legal values are provided for the potential responses to the DISSEMINATOR field (Y or N).

There are several classes of information in IISS for which legal values information is not provided. These include:

1. Range of values to be associated with option switches. For example, the switch for line size in the START DEVICE form (Figure 21) is entered in the format:

   /SZ:N

   where N is the override line size for use in input or output file specification. The display provides no information on the default line size, nor on what values would be legal as values for N.



CLASSIFICATION ***CAVEAT***

START DEVICE

OUTPUT:_____
INPUT :_____

OUTPUT SWITCHES FOR FUNCTION:	USE:			INPUT SWITCHES FOR FUNCTION:	USE:
APPEND	/AP	MASTER TERM	/MT	DELETE AT CLOSE	/DE
UPDATE	/UP	SUPERSEDE	/SU	NO LON ON	/NL
USER TERM	TTØ:	LINE SIZE	/SZ:N	LINE SIZE	/SZ:N
LIST ONLY	/LO:PRINTØ				
SPOOL	/SP/LO:NAME				
LINE PRINTER	/LPO:/LO:NAME				

NOTE: IF INTERACTIVE DEVICE, ONLY SPECIFY ON OUTPUT LINE.

Figure 21. Start Device Form. Redrawn from *IISS User's Manual*, p. 3-6.

2. Honeywell Signon Information. No information is provided for WWMCCS classification codes required for signing on to the EUCOM AIDES N-6ØØØ.

3. Format for file specification, required for identification of both input and output files, is not identified in IISS displays.

4. Codes for JINTACCS message dissemination header, to be entered into the IN ANAL Dissemination Header Form (Figure 22), are not available to the user from system files. It should be noted that the maximum size (which may also be the only legal size) for the codes is indicated by the "blanks" or "underlines" associated with the corresponding field.

5. Codes for the main body of JINTACCS messages (see Figure 16 for an example) are not available to the user from system files. Legal or maximum input string lengths are indicated by the number of "underlines" in the JINTACCS message blanks.

6. Legal formats for UTM-GEO conversion are not indicated (see Figure 23), although the maximum string length is indicated by the number of "underlines" in the form.

7. Legal formats for TACOB data base entries (see Figure 19) are not provided in system files or in IISS displays.

When the user is in GIM Language or TELETYPE modes, there is essentially no legal value or format information available from IISS.

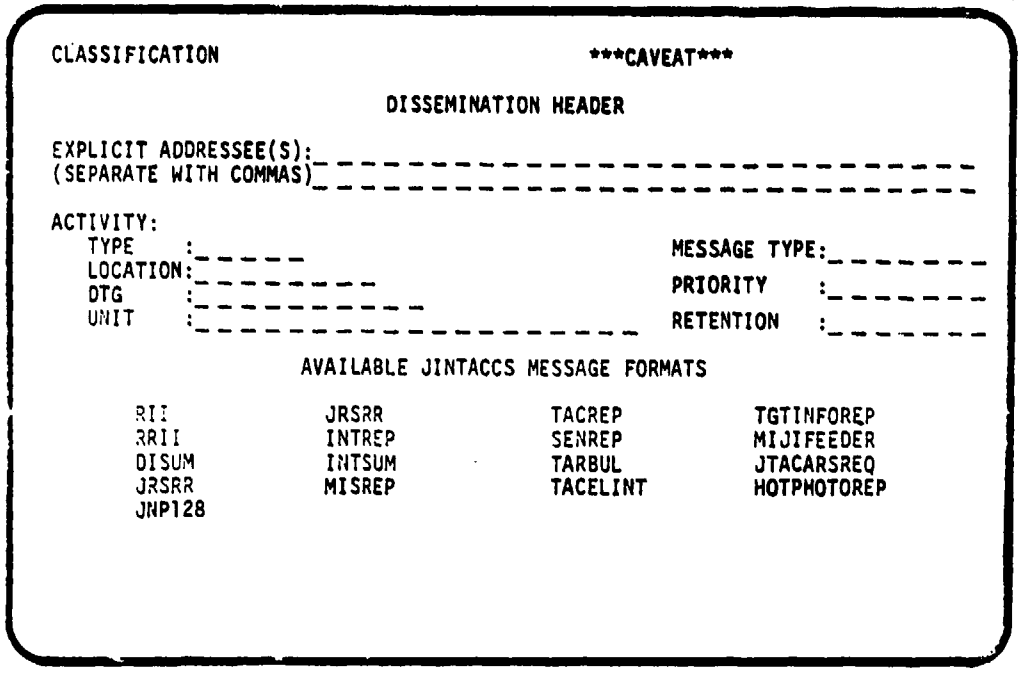


Figure 22. IN ANAL Dissemination Header Form. Redrawn from *IISS User's Manual*, p. 3-20

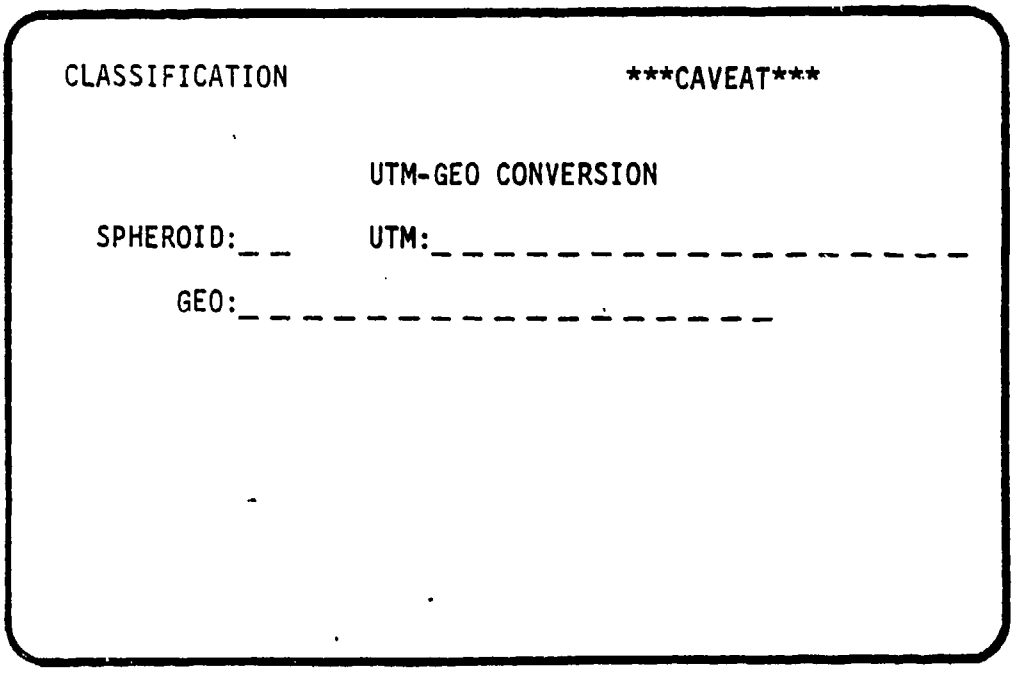


Figure 23. UTM-GEO Conversion Form. Redrawn from *IISS User's Manual*, p. 3-37.

3.2 Unburdening of Input

IISS contains several features which reduce the number of activities which users must perform to control system operation or to enter information into system files or messages:

3.2.1 Encoding of Information. Much of the user input to IISS is entered in the form of codes, rather than full words or phases. This reduces both the time required to enter information and the probability of typographical error. This encoding appears in many IISS operations, including:

1. Specification of forms option switches.
2. Input of codes for JINTACCS dissemination headers and message bodies.
3. Input to TACOB files.

3.2.2 Automatic Generation of UTM and GEO Coordinates. TACOB data files hold georeference data in both UTM coordinates and GEO (latitude/longitude) form. The user does not have to enter both sets of coordinates, however. When one is entered, the other is automatically generated.

3.2.3 Automatic Entry of Update Date (UDATE). When a new record is added to a TACOB file, the structure of the data base and system requires that an update date be entered. Instead of requiring the user to enter the date, the IISS system automatically assigns it.

3.2.4 Automatic Update of Position Track. Some intelligence operations require knowledge of the position of enemy units over time. Thus, when a new position is identified, the old position (and associated date) must be saved when the new one is entered. The system automatically performs this operation when new positions are entered.

There are a number of alterations to IISS which would reduce the input burden on analysts considerably. These include:

1. Capability to store retrieval strings for subsequent use.
2. Capability to store report formats for subsequent use.
3. Capability to enter units as the center points of circle searches.
4. Use of the system clock to automatically assign certain date fields with provisions for analyst override.

5. Provisions for automatic assignment of file designations, as opposed to the current method of having the users/operators assign file names.

6. Acceptance of either UTM or GEO data as position indication, with the system ascertaining which type of coordinate was entered.

7. Provision of informative menus for switch specification.

8. Menu selection of Classification and Caveat headers.

9. Automatic determination of Classification and Caveat headers based on data base or message content.

3.3 Interrupts and Work Recovery

IISS has two provisions for limiting the impact of interrupts in work flow processing:

3.3.1 Use of Defined Screen Areas. Since the SU 1652 as used in IISS has a number of defined screen areas, high-priority interrupts need not necessarily disrupt ongoing work. Messages and instructions routed to user terminals while the user is working on other activities can be made to appear in other screen areas.

3.3.2 Incomplete JINTACCS Messages. When entering JINTACCS messages, the user may be required to complete a higher-priority activity. To save the partially-completed message, the user may hit the END MSG VFK. This permits the analyst to either order dissemination of the message or to save the partially completed message in a file. Saving the message allows the user to complete it later. [NOTE: *completion of the message is not supported by the JINTACCS forms available from the IN ANAL option; the user must enter the information without supporting format and content information*].

4. MESSAGE COMPOSITION AIDS

4.1 System Design Features

IISS supports generation of two types of messages: free-form analyst-to-analyst messages and JINTACCS messages.

Analyst-to-analyst messages are largely free format; most of the work in creating these messages will involve typing in free text. Elements of

the JINTACCS messages are also free text, but there is in addition a significant amount of highly structured categorical information in the formats. Entering this highly structured information would benefit from an input menu approach rather than the form filling strategy that is currently used.

4.2 Format for Alphanumeric Messages

There is no set format for the analyst-to-analyst messages which can be generated by IISS. The content of the messages is completely free-form; the analyst must merely enter the desired information into the USER MESSAGE form (Figure 14). The switches listed at the bottom of the form determine the dissemination, file residence, and media of the user messages.

JINTACCS messages are constructed in the specified JINTACCS format. Using the IN ANAL option, the creation of JINTACCS messages is supported by message composition forms (see Figure 16 for an example). The format for these messages is precisely as specified by JINTACCS personnel; no effort appears to have been made to alter the format. Although the field labels are all provided in the message formats, the user must be familiar with the format and content of the information entered into the forms.

4.3 Format for Graphic Messages

IISS operation does not entail composition or receipt of any graphic messages.

5. DATA RETRIEVAL ASSISTANCE

5.1 Query Methods

Query of TACOB data bases is one of the primary functions of IISS. Therefore, it is imperative that USAREUR GOB analysts be able to perform data base queries efficiently and effectively. IISS accommodates to the varying experience of its users by providing two separate retrieval/query methods:

5.1.1 Man-Machine Interface (MMI) Retrievals. In this method queries are supported by detailed prompting forms. The user identifies the characteristics of the desired order-of-battle records by filling out a Selection/Retrieval Screen (Figure 24). Individual Selection/Retrieval screens are available for each TACOB data set. After having described the desired record

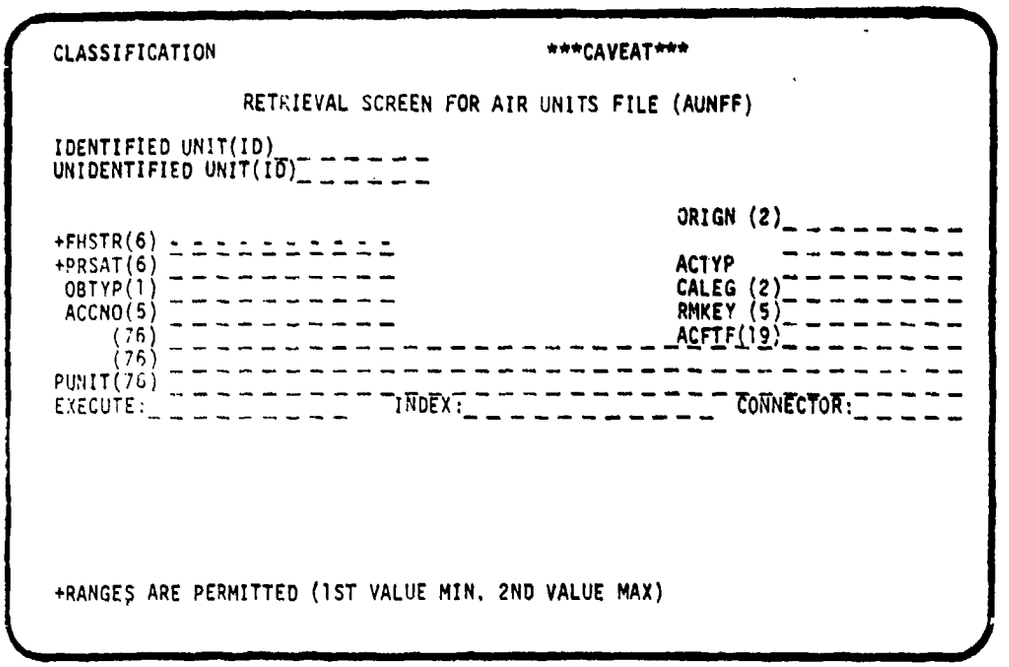


Figure 24. Example of a Selection/Retreival Screen. Redrawn from *IISS User's Manual*, p. 3-41. (Note: not all field labels are included in this figure because the photocopy of the document used for analysis was unreadable.)

characteristics, the Index List (Figure 17) appears. The user may light-pen any of the "hits" to receive a Full Record Display (Figure 19).

5.1.2 GIM Language Retrievals. In this method the user enters GIM language commands to define the characteristics of the records which are to be retrieved. Use of the GIM language requires that the user be familiar not only with the structure of the GIM query language, but also with the structure and content of the TACOB data bases from which records are to be retrieved.

With either of the query methods, the user may employ a predefined output specification (see the discussion of the REPORTW option on page 31), or accept a system default format for individual records.

The MMI retrievals are not as flexible as the GIM Language retrievals. There are some GIM Language capabilities which are not available via MMI, and others which seem to result in more efficient processing than the analagous MMI procedures. For maximum system utility, the MMI should provide all of the capabilities currently provided by the GIM Language. The efficiency of the process specified by either method should be comparable.

5.2 Query Structure

The structure of MMI retrievals is implicit in the structure of the forms to be filled out to complete query specifications. The user must, however, know enough about the content of TACOB data bases to be able to specify retrieval parameters based on TACOB file record elements. As mentioned earlier, IISS has no provisions for displaying legal value or range information to its users.

The structure of the GIM language is in two parts--grammar and syntax. The GIM codes, grammatical elements and syntactical elements are described in some detail in Appendix F.

The utility of query structure for IISS could be enhanced in at least two ways:

1. Alteration of the DELETE capability of the GIM language to require user/operator verification of deletions from multi-valued fields.

2. Implementation of a route search function to supplement the circle and polygon geographic searches already provided.

6. GLOSSARIES

6.1 Standard Terms

There are several sets of terms which are candidates for standardization throughout IISS. These include:

6.1.1 Function Key Labels. Terminology on IISS fixed and variable function keys is standard throughout IISS operations. This is natural for the fixed function keys, but the IISS treatment of variable function keys assures that their action will be consistent in all system activities. Functions of VFKs are not altered across system elements and features, though they may or may not be available at different times.

6.1.2 Option Switches. The MMI forms associated with various IISS operations depend partially on the use of option switches for control specification. Option switch code structure and function is an obvious potential source of inconsistency within IISS. The implementers of the system, however, appear to have taken appropriate precautions to ensure consistency. There is

no evidence of switches with the same function having different code structure, nor of switches with identical structure having different functions. The switch list appears in Appendix G.

6.1.3 TACOB Data Sets. The record element labels of the TACOB data sets are another obvious source of potential inconsistency. If similar information is labeled differently, users will tend to make errors when retrieving from different data sets. These inconsistencies are not serious in TACOB data base record element labels, although some improvements could be made. A listing of the TACOB record elements used in IISS appears in Appendix E.

6.1.4 IISS Function References in Menus and HELP Files. In general, the terminology in the MASTER MENU (Figure 7), the GIM MENU (Figure 8), and the IISS HELP listing (Figure 11) are consistent.

6.1.5 Command Language Terms. Terms such as those associated with the GIM Language (Appendix F) and those associated with the TELETYPE option of the MASTER MENU (pages 16 through 18), should be consistent. In general, there is admirable consistency within IISS. There are, however, some inconsistencies between menu terms and TELETYPE MODE commands which should be rectified.

6.2 Character Sets and Labels

IISS employs all of the standard typewriter characters. The IISS functions which involve free text entry demand considerable flexibility in the available character sets. Some special characters are used as special delimiters in various IISS functions; these are listed in Table 5.

6.3 Glossary Availability and Use

The IISS term and code sets which can be thought of as "glossaries" are listed in Table 6, along with an indication of their availability and use in IISS operations.

6.4 Abbreviations and Coding

Most IISS code sets employ mnemonic abbreviations. The rules for forming these mnemonic codes are apparently not rigorous, but they are reasonably logical. Table 7 gives some examples of the encoding rules employed for TACOB record element labels. The complete set of record element codes is provided in Appendix H.

Table 5

Special Characters used as Delimiters in IISS

SPECIAL CHARACTER	USE/APPLICATION
/	Precedes switch specification; delimits series of switches.
:	Separates switch from switch parameter.
[ ]	Encloses UIC code in file specification.
_ (underline)	Indicates available blank space in input format.
>	Terminates system prompt in TELETYPE mode.
#	Mandatory termination of TELETYPE commands when terminals other than SU 1652 are used.
" "	Indicates literal values in GIM command language.
*	Separates subfields in GIM command lines.

Table 6

IISS Glossary Availability, Use, and Memory Burden

GLOSSARY NAME/ DESCRIPTION	NUMBER OF ELEMENTS	AVAILABILITY	USE IN IISS	MEMORY BURDEN IMPOSED
FFK labels	24	Always available, printed on function keys.	Used for terminal-oriented operations, such as editing and cursor control.	User must remember what FFK labels signify; no on-line help for interpreting FFK function; detailed explanations in documentation.
VFK labels	28	Always available, printed in key label cells corresponding to each VFK.	Used for system-oriented operations, such as displaying the MASTER MENU.	User must remember what VFK labels signify; no on-line help for interpreting VFK function; detailed explanation in documentation.
Option switches	27	In MMI mode: Brief (1-2 term) explanation of switch meanings and formats.	Entered on "input" and "output" lines of MMI forms to control IISS operations (START DEVICE; USER MESSAGE; BDT; RJE).	The brief descriptions help somewhat to reduce the memory burden, but they do not explain in detail the switch functions No information (legal values; range limits on switch parameter entry.
		In TELETYPE mode: No information on switches at all.	Entered directly into command lines to control same IISS operations as in MMI mode.	No aids to recall of switch format or use.
TACOB Data Set names	5	Not listed in IISS menus or files.	User must attach to a particular data set.	User must remember what data sets are available.

Table 6 (Continued)

GLOSSARY NAME/ DESCRIPTION	NUMBER OF ELEMENTS	AVAILABILITY	USE IN IISS	MEMORY BURDEN IMPOSED
TACOB File names	14	In MMI mode: Listed on GIM MENU.	User must select a particular "file" name for analysis or input by light-penning it on the GIM MENU.	File mnemonics are listed on GIM MENU; user must recall from memory what is stored (in general) in each file. No explanatory information re file contents available in system. Complete explanation of file content available in documentation.
		In GIM LANGUAGE mode: No information available.	User must enter file name in command line to specify what file is to be used.	User must recall file mnemonics as well as what kinds of information are stored in files. No mechanism for reducing memory burden.
TACOB File Record Element names	375 for all files. ~55 for GOB & BIO.	In MMI mode: Presented on selection/ retrieval screens and in Full Record Display (element mnemonics).	User must enter values or ranges associated with element mnemonics to define retrievals.	Display mnemonics serve as data entry cues; user must recall meaning of mnemonics. Complete information available in documentation (on meaning of record element mnemonics).
		In GIM LANGUAGE mode: No information available.	User must enter record element mnemonics to define retrieval parameters.	User must recall record element mnemonics as well as type of information associated with each record element type. Complete information on meaning of record element mnemonics available in documentation.

Table 6 (Continued)

GLOSSARY NAME/ DESCRIPTION	NUMBER OF ELEMENTS	AVAILABILITY	USE IN IISS	MEMORY BURDEN IMPOSED
GIM Language Terms	137	No information available from IISS menus or files.	Used only in GIM language mode; defines the nature of desired file operations; connects file and record element names.	User must remember all significant elements of GIM language; no on-line references to GIM grammar, syntax, or terms.
IISS-specific record element entries.	Unknown; probably low (∿1Ø).	No information on legal values presented in any IISS mode.	When entering values for certain record elements, user must enter one of a limited number of codes.	User must remember all legal values; no format or content indications in any displays. Information in available documentation.
IISS record element entries (externally imposed).	Unknown; probably high (∿1ØØ).	No information values presented in any IISS mode.	When entering values for certain record elements, user must enter one of a constrained number of codes. These codes have apparently been defined externally (e.g., they are formal U.S. Army codes), and must be adhered to for the sake of standardization.	User must remember all legal values; no format or content indications in any displays. Information available in documentation *(Intelligence Information Subsystem Catalog of Authorized Data Elements and Codes, not reviewed by the project team)*.

Table 7

Examples of TACOB Record Element Mnemonic Encoding

Term to be Encoded	Context (Entire Phrase to be Encoded)	Code Used For Term	Complete Code	Comment
Country	Country of control	CNTY	CCNTY	Mnemonic is apparently for "control country"
	Country of allegiance	C	CALEG	
	Country of world	CNTRY	CNTRY	"World" apparently not involved in code construction
	Country of location	CO	COLOC	
	Country of nationality	CNTY	NCNTY	
	Country of location	CNTY	LCNTY	
Message	Message text	MG	MGTXT	
	Message identification	M	MIDENT	
	Message originator	M	MORIG	
	Message line number	MSG	MSGLN	
	Narrative text	NARTV	NARTV	"NAR" is abbreviation for "narrative"
Equipment	Equipment function	E	EFUNC	
	Equipment authorized	EQ	EQATH	
	Equipment on hand	EQP	EQPOH	
	Equipment type	EQ	EQTYP	
	Equipment user.	E	EUSER	

7. ERROR HANDLING

7.1 Error Prevention Techniques

IISS contains a number of techniques designed to prevent errors of command and data input:

7.1.1 Field Size Indication. On both MMI (process control) and full record displays (data entry) the field size indication shows the user unequivocally how many characters can be entered. There is generally no indication of whether this number of characters is the maximum number allowed or the only number allowed.

7.1.2 Use of Light Pens. The use of light pens for command and file selection allows the user to select from options which he/she is actually looking at, rather than reading or recalling commands/data and entering the commands at the terminal keyboard.

7.1.3 Presentation of Data Element Labels. The presentation of data element labels reduces the memory burdens on users by eliminating the necessity for user recall of record element mnemonic labels.

7.1.4 Indication of Active Screen Areas. IISS indicates which screen area of the SU 1652 is currently active. This reduces the probability that the user will enter the data in an incorrect screen area.

7.1.5 Automated Creation of Data Values. Automatic creation of data values such as date and geographic coordinates, reduces the burden on the operator. A concomittant effect is reduction of the number of items which the user must enter, thus reducing the opportunity for error.

7.1.6 Lighting of VFK Labels. VFK labels are lit when they are active, thus assuring that the user will not waste time or cause an error by pressing VFKs which are not currently available.

7.1.7 Presentation of "Switch" Options. The presentation of "switch" options on MMI forms assures that the user is constantly presented with all legal values where switch options are available.

7.1.8 Availability of Various Date Formats. For most TACOB "date" record elements, the user can enter dates in any of the following formats:

1. January 15, 1974
2. 15 Jan 1974
3. 15 Jan 74
4. 1-15-74
5. 1/15/74
6. 14 January 1974
7. 15-Jan-74

Even if the user forgets one of the date formats, it is likely that any rational date entry format will be accepted by IISS.

7.2 Error Detection Techniques

The GIM DBMS employed in IISS has a number of capabilities for error detection. These capabilities are employed to maintain data base integrity, and include:

7.2.1 String Length Evaluation. The system checks the input to determine whether the character string entered is of appropriate length. GIM can check for both maximum and minimum string length limitations.

7.2.2 String Content Evaluation. If input values are to be limited to a small number of predetermined values (e.g., "H" for high, "M" for medium, "L" for low), GIM can test to determine whether the input contains one of these legal values. This techniques is used to check for legal input values for the STCAT (strength category) record element of the EUNITS File, for example. Here the legal values are "O," "N," "E," and "C."

7.2.3 Table Lookup Legal Value Checks. Where the number of legal values for a record element is large, the GIM software can check the input string against a table of legal values. This techniques is used to evaluate country code inputs in IISS.

7.2.4 Conditional Validity Checks. The input is evaluated against other data already contained in the TACOB data set. Relational and arithmetic rules determine whether the input is valid.

7.2.5 Multielement Data Sufficiency Checks. Some data elements in TACOB files can only be entered if a corresponding data element is also entered. For example, when a new location (GEOLO or UTMLO) is entered to an EUNITS record, the corresponding "change location date" (CLDAT) must also be entered. This assures that the USAREUR analysts will know how current position reports are. The GIM software of IISS performs these checks.

Error detection would be improved if errors in GIM Language command elements were detected as the user types them into the terminal. This approach would, of course, require the use of the local processing capabilities of the SU 1652. For a completely satisfactory implementation it might require provision of local (i.e., SU 1652-controlled) peripheral memory (such as floppy disks).

7.3 Error Feedback Provisions

IISS provides a number of error messages in screen area 6 (bottom of the right screen on the SU 1652). A complete list of error messages is included in Appendix I. This list includes a number of error and systems messages which are not tied to user errors *per se*, but which may result from system errors or programming errors (e.g., INVALID EXTENDED STORAGE SUBPOOL; SUPERVISOR DIRECTIVE FAILURE; WRITE ERROR ON MSNTOS FILE). The available documentation is unclear about whether such messages are ever presented to the USAREUR analysts who use IISS. If they are, it is likely that they would not be particularly meaningful. The error messages in Appendix I appear in Appendix B of the *IISS USER'S MANUAL*. The list is apparently not comprehensive, however, since examples of processing contained in the *IISS TACOB DATA BASE USERS GUIDE* list error messages which are not contained in Appendix B. Some examples of these error messages are contained in Table 8. These examples are derived from IISS interaction in the GIM LANGUAGE mode, but it is presumed that the same sorts of error feedback occur during MMI interaction. Note that this is far from an exhaustive list; the available documentation and extent of on-site data collection did not permit a comprehensive listing of error code types and associated error messages.

7.4 Error Correction/Recovery

Once errors have been detected, they can be corrected in one of two ways: The screen area may be cleared, and the entire statement re-entered. Or, the

Table 8

Error Messages Encountered During IISS Operations

GIM COMMAND STRING	ERROR MESSAGE	INTERPRETATION OF ERROR MESSAGES
For EUNITS "HAGAV66666" ADD CMBRR "3"	76Ø3 THIS DATA LIST NOT ACCESSIBLE TO UPDATE	The EUNITS file cannot be updated; the user must update either the IUNITS (identified units) or UUNITS (unidentified units) file.
List EUNITS "HAGAV66666"	"HAGAV66666" IS NOT AN ITEM-ID IN SPECIFIED DATA LIST(S) 72Ø8 NO ITEMS SELECTED	The EUNITS file contains no such data item in its item list.
For IUNITS "HAGAV66666" ADD CRTNM "REDBEAGLES"	1Ø21 IN ITEM ID "HAGAV66666" THE ATTRIBUTE WHOSE AMC IS 4 IS A SINGLE VALUE REJECT AND ALREADY HAS A VALUE ON THE FILE	The user has tried to ADD a current name (CRTNM) to unit "HAGAV66666." This unit has a current name, and is set up to reject any values ADDed to that field. To change the CRTNM, the user must use the CHANGE verb in the GIM language.
For UUNITS "UN*99999" ADD RRDAT "12-APR-79"	7214 THIS STATEMENT HAS FAILED ITS EDIT SPECIFICATION	The error message merely indicates that the command statement processor detected an error. What actually happened was that the user attempted to ADD a combat readiness rating date (RRDAT) without also ADDing the combat readiness rating (CMBRR). This procedure is not allowed by the GIM edit processor.
For IUNITS "HAGAV66666" ADD UTMLO "36SVA05544093"	7214 THIS STATEMENT HAS FAILED ITS EDIT SPECIFICATION	The error message merely indicates that the GIM edit processor has detected an error. Actually, the UTM location (UTMLO) cannot be altered without simultaneously changing the "change location date" (CLDAT).
For IUNITS "HAGAV66666" ADD NODAY "65"	76Ø8 THE D2 ATTRIBUTE 'NODAY' IS NOT DIRECTLY PRECEDED BY ITS D1	The user has attempted to store the number of days of training (NODAY) without also storing the parent field "training type" (TRTYP).

screen editor and cursor FFKs of the SU 1652 may be used to correct the error in the command or data entry input.

The IISS system does not evaluate command lines or data entry codes as they are typed onto the terminal screen. Rather, the information is evaluated after the information is transmitted to the IISS processor (i.e., after the SEND FFK is pressed). The available documentation did not indicate how legal, but erroneous, process control specifications may be terminated (e.g., how to interrupt a geographic search where geographic parameters are incorrect).

8. USER/OPERATOR CONFIGURATIONS

There are essentially five types of user/operators in the IISS system:

1. USAREUR HQ GOB analysts.
2. CORPS-level GOB analysts.
3. Intelligence Support Element (ISE) personnel.
4. IISS system operator personnel.
5. G2 command personnel.

The first three types are essentially similar. The USAREUR HQ GOB analysts perform all of the TACOB (or other GOB file updates), while the Corps-level and ISE users typically perform only retrievals. Restrictions on user activity are easily controlled by system personnel, so it is not inaccurate to consider the first three types as essentially identical.

The ARI/Synectics review did not evaluate the role of the IISS system operator personnel. During on-site observations, these personnel were primarily supporting the operations of the analyst-users. There was insufficient time to perform adequate analyses of both classes of "hands-on" users/operators; reviewing analyst/system interface was selected as being of higher priority.

The role of the G2 command personnel was evaluated only tangentially. These personnel have an extremely significant role, since they often develop the intelligence problem sets which define the system interaction requirements for the GOB analysts.

Ignoring the role of the IISS system personnel, there are essentially Two user/operator configurations which are important in IISS operations:

1. GOB analysts operating autonomously. There are many tasks which the GOB analysts will perform with little or no supervision from or coordination with G2 command personnel. Most of the data base updates, for instance, can only be performed by the GOB analysts themselves. A complete and up-to-date data base is critical to the overall utility of IISS. Updating it is in essence a "background-mode" operation: updates must be performed when time is available and when critical retrievals are not required by command personnel.

2. GOB analysts operating under direct supervision of G2 personnel. Particularly during crisis periods battlefield-echelon intelligence officers will be attempting to collect, coordinate, and analyze intelligence of direct relevance to combat commanders. Since IISS will be a significant resource for order-of-battle information, it is likely that intelligence officers will be interacting directly and frequently with IISS GOB operator/analysts.

CONCLUSIONS

The Intelligence Information Subsystem (IISS) First Milestone System (FMS) appears to incorporate all important functions required to support U.S. Army Ground Order-of-Battle (GOB) analysts in establishing, maintaining, and exploiting order-of-battle files. There is no technical reason why it should not prove to be a significant asset to Army intelligence and command missions. The designers of the system made serious attempts to make IISS simple for its users/operators to use, providing such features as:

1. Menu selection of major system functions.
2. Use of light pens for menu selection.
3. A potentially powerful and informative error detection and feedback system.
4. A dual-screen CRT with powerful local processing capabilities, which expands opportunities for providing system users with convenient, informative interfaces with IISS hardware and software.
5. Extensive use of fixed and variable function keys for text-editing and process control.

With capabilities and characteristics like these, IISS should be one of the most user-oriented systems extant. Unfortunately, it falls short of its potential in most areas of human factors design.

IISS does indeed incorporate many, if not most, of the design features which could be recommended for a system like it. But the potential of these design characteristics is typically not realized throughout the system. Examples of outstanding design appear at various points, but are replaced by inferior methods in situations where they might be even more profitably employed. Areas in which desirable IISS design features are not used throughout the system include:

1. Access to HELP information. IISS contains a single HELP display which provides brief descriptions of the major functions of IISS. No other HELP displays are provided.
2. Use of informative menus. IISS uses menu selection for commands in its MASTER MENU and GIM MENU. Yet other functions employ inferior methods, even though there is even more need for conveying detailed information to the user/operator to support complex command and data entry decisions.

3. Error message. The Generalized Information Management System used in IISS contains powerful error detection and feedback capabilities. The language contained in error messages is, however, often too formal and stilted. Error messages appear to presume that users/operators will be relatively familiar with ADP and data base structure terminology. And some messages simply do not contain enough information about the error to guide users/operators to the appropriate remediation measures.

4. Information on legal entries. Certain IISS command forms use "switches" to define user/operator command intentions. These switch options are displayed on the command forms, providing information on legal form entries. But information on parameters associated with the switches is not provided. Worse yet, information on legal entries is notably lacking in data input situations; it is provided only in inconvenient and easily mislaid system documentation.

5. Consistency in command and data entry terminology. In general, terminology in IISS is admirably consistent. There are, however, some gratuitous and aggravating deviations from consistency which unnecessarily reduce the system's ease of use.

Proliferation of these features throughout IISS would tremendously increase the capability of users/operators to profitably employ its capabilities.

In addition to design features which already exist in some form within IISS, there are others which might be used to enhance the system's user interface. These features are discussed in detail in other sections of this report, and will not be discussed in detail here. It must be noted, however, that IISS is far from the worst interactive system which has been created in recent years. There are, in fact, significantly inferior examples within the current Army retinue of battlefield automated systems. It is also important to realize that IISS is not in any way an "unusable" system. Given sufficient training and experience, many Army intelligence analysts should be able to master the intricacies of the system. In peacetime situations the design deficiencies may not even impact severely on IISS operational throughout and data base integrity. But IISS is a tactical system. In battle, or even in periods of crisis, deficiencies which ordinarily seem trivial may be vastly magnified. Where an error in the position of an enemy unit would be detected and eventually rectified without consequence in peacetime, it may result in the unanticipated appearance of enemy forces on an exposed flank in time of

war. Intelligence analysts exposed to the stresses and rigors of combat deserve the most capable, easiest to use ADP systems which modern technology can provide. Potentially modest enhancements to IISS should yield significant benefits in this regard.

It would be inappropriate to end this discussion of conclusions about IISS without considering factors which mitigate the strength and conviction with which they can be made. There are at least four situations which affect any conclusions which might be drawn:

1. The developmental status of IISS. IISS is in its initial fielded configuration; it is apparent that many aspects of its design are not yet optimized. It may be that many of the suggestions contained in this document are already planned and are awaiting initial user feedback for detailed design direction. It is also possible that some of the observed "design defects" are not design defects at all, but are rather results of previously undetected bugs in system or applications software.

2. Lack of operational exercise experience. IISS was observed during the course of a military exercise, but it was not specifically an intelligence exercise. The conditions of the exercise probably did not realistically duplicate those which would exist in wartime intelligence analysis. Design features which currently seem acceptable may turn out to be intolerable in more rigorous operational contexts; those which currently appear as glaring deficiencies may cause little or no problems in actual system operation. One of the primary purposes of this document is to provide IISS developers and proponents with a body of opinion about the human-machine interface. The kind of human factors analysis which was performed attempts to encapsulate and distill the results of previous experience and research results. It is recognized, however, that every system implementation is unique, and must operate in a unique environment. The results of more operationally realistic exercises must be used to temper and evaluate the conclusions and recommendations presented here.

3. Unintended employment of system capabilities. During the ARI/Synectics observation of IISS operation, it became apparent that the GOB analysts using the system were not using it as its designers intended. IISS was designed primarily as an order-of-battle data storage, maintenance, and exploitation system. The systems analysts, programmers, operators, and training personnel associated with IISS estimated that 80 to 90 percent of interactions with the system were to send or receive user messages. The relative paucity of analyst employment of core IISS capabilities may have colored perceptions of system characteristics to the detriment of this analysis.

4. Lack of an appropriate data base. One of the most consistent criticisms of IISS concerned the structure and content of the TACOB data base. It does not seem to have been designed with the needs of its principal users (Army GOB analysts) in mind. Many TACOB files are not used by the analysts; some of the most vital data elements are missing from the files which are used. It is difficult to determine exactly what effect this has had on the analysis, but it is likely that the scope and emphasis of the investigation would have been different had a finalized data base structure existed. Some of the criticisms included in this document are direct results of the way in which TACOB is structured. It is hoped that the deficiencies which led to these criticisms will be corrected in the improved data base structure currently being developed.

One observation which can be made about IISS is not strictly speaking of human factors concern. The observation is this: system retrievals are simply too slow. A complex retrieval from a 2ØØØ record data base can require more than 3Ø minutes. This seems highly inappropriate for a tactical data system, and must be extremely frustrating to system users. It is conceivable that the slowness of the system may be one reason why the order-of-battle-related capabilities are not often employed by IISS users/operators. While there are some methods for overcoming the system's speed deficiencies, they are apparently not easy for the analysts to use.

RECOMMENDATIONS

Specific recommendations for altering the IISS human system interface are discussed briefly in the "Analysis" section of this report. These recommendations are further detailed in the Transaction Feature Analyses contained in Appendix A. The detailed suggestions will not be repeated here, but a summary of their primary intent is appropriate. IISS human-machine interface could profit from application of the following general principles:

1. Provide more information on command structure and effects. This sort of information is currently available only in system documentation. Summarized versions of this information in IISS HELP files would substantially enhance system utility.

2. Provide much more detailed information on legal entries. Except for indications of the maximum length of input strings, IISS contains virtually no information on legal value content and format. Provision of legal value information would simplify entry of both order-of-battle data and message content. If possible, legal entries information should be contained in prompts or menus; presentation of legal values information in HELP displays is a less attractive, though still viable, alternative. Implementation of this recommendation will provide particular benefit to relatively inexperienced IISS users/operators.

3. Tailor IISS functions to the needs of its primary users. There are few detailed recommendations in this area, since the ARI/Synectics interview team did not have an opportunity to evaluate user (GOB analyst) requirements to any great degree. It is apparent, however, that IISS provides little in the way of tailored capabilities, other than the content and structure of the order-of-battle data bases themselves. IISS functions should reflect the mission, responsibilities, and desires of its primary users. As yet, there is almost no evidence that this has been accomplished. Identification of these functions will require establishment of a dialogue among command (operational) personnel, intelligence analysts, and system designers/developers/proponents.

4. Establish and rigorously enforce consistency in system terminology, structure, and abbreviation conventions. IISS is not tremendously deficient in this area. The few areas for potential improvement are particularly aggravating, since the system is in general quite good. The existing inconsistencies are a wholly unnecessary source of user/operator error, inefficiency, and frustration.

5. More fully exploit the capabilities of the SU 1652 terminal. Adding selective highlighting capabilities, graphics displays, and a more flexible exploitation of the dual-screen display potential are important areas for IISS development.

6. Increase system retrieval efficiency. The IISS can take 3Ø minutes or more to complete a search through a 2ØØØ record data base. This retrieval time needs to be reduced for an order of magnitude or more. Otherwise, the IISS will be extremely frustrating for users/operators attempting to accommodate to the requirements imposed by high-threat or wartime tactical missions.

7. Increase error message intelligibility and information content. Current error messages and formats presume too much user/operator knowledge of ADP operations and data base structure. They are also too weakly linked to the actual errors which have occurred.

APPENDICES

APPENDIX A

TRANSACTION FEATURE ANALYSES OF IISS

1. CONTROL METHODS

1.1 Command Languages

- *Transaction Feature*. Man-Machine Interface.

  Description. The Man-Machine Interface of IISS simplifies the specification of IISS commands. The user/operator is not required to commit all of the commands to memory, but is presented with a menu or list of the possible commands in system displays. The Man-Machine Interface also provides prompts for data entry.

  Behavioral Implications. The memory burden on IISS users/operators is greatly reduced.

  Transactional Implications. Because responses to Man-Machine Interface displays are translated into GIM-II of DEC system monitor commands, there is little or no impact on system responsiveness, processing speed, or system accuracy.

  Consequences. The system is easier for the user/operator to use than if a pure command language were used. Users/operators who are experienced in GIM-II grammar and syntax can use that language to increase command efficiency.

  Recommended Resolution. None required, except as indicated in other Transaction Feature Analyses.

- *Transaction Feature*. GIM-II command language.

  Description. The GIM-II command language is an extremely powerful one. It permits the IISS user/operator to perform almost all of the storage and retrieval operations which could possibly be required with order-of-battle data.

  Behavioral Implication. The IISS user/operator is not constrained in the range of storage or retrieval operations which can be performed with IISS. This reduces the frustration of users/operators, particularly the more ambitious and experienced ones.

  Transactional Implications. The power and flexibility of the GIM-II language reduces the need for complicated specialized programming to support required IISS functions. The format structure of the language makes it relatively easy to "front end." This permits the establishment of simplified command entry procedures such as the Man-Machine Interface currently used in IISS.

  Consequences. Battlefield commanders will not be significantly constrained in the range of requests they can make for extractions from the order-of-battle data bases. Users/operators will be pleased with the flexibility afforded by the language.

Recommended Resolution. None required.

Transaction Feature. Execution of IISS commands without resorting to GIM-II language.

Description. In most cases, the IISS user/operator can perform functions from either the MMI mode or from within the GIM-II language. There are, however, two capabilities which can only be executed from the GIM-II language mode.

1. Full specification of report formats.
2. Conditional retrievals from TACOB data bases.

Behavioral Implications. The memory burden imposed by knowing the GIM-II language command grammar and syntax may prevent less experienced users/operators from performing required system activities.

Transactional Implications. The users/operators are likely to make errors in attempting to use command methods with which they are not intimately familiar. They may not be able to perform their assigned tasks.

Consequences of the Problem. Intelligence reports and summaries may be delayed.

Recommended Resolution. Prepare and incorporate MMI screens to enable users/operators to perform all functions currently accessible via the GIM-II language operating mode.

I.2 Menus

Transaction Feature. Use of menus in IISS.

Description. The MASTER MENU and GIM MENU of IISS provide the user/operator with a convenient method for selecting among major IISS processing options. Switch options on Man-Machine Interface forms also provide menu-like features.

Behavioral Implications. The memory burden on users/operators is greatly reduced. Users/operators are presented with only those processing options which are valid at any point in system operations.

Transactional Implications. System operations are not impaired in any way by the inclusion of menus in IISS interaction.

Consequences. The memory burden on IISS users/operators is minimized. Users/operators can proceed through sequences of IISS processing activities in a logical, "decision tree," fashion.

Recommended Resolution. None required, except as indicated in other Transaction Feature Analyses.

- *Transaction Feature*. Amount of information in MENU displays.

  Description. Both the MASTER MENU (Figure 1) and the GIM MENU (Figure 8) indicate available options by listing brief terms or abbreviations for those options.

  Behavioral Implications. The user/operator must remember the meaning of the terse option descriptions. This poses an unnecessary memory loading on the users/operators of the system.

  Transactional Implications. Failing to recall the meaning of the terse prompts may result in the user/operator selecting an inappropriate item from the menus, or in the necessity for looking up the meanings of prompts in reference documentation.

  Consequences of the Problem. Delivery of critical intelligence information may be delayed.

  Recommended Resolution. Make the option descriptions more informative. Possible display configurations for the MASTER MENU and the GIM MENU appear in Figures A-1 and A-2, respectively. Note that these menus presume the use of a light pen for option selection. Light-penning the "RETREIVE OR MODIFY ORDER-OF-BATTLE DATA" option from the GIM MENU would result in a display like the one in Figure A-3. Selecting the "INPUT ORDER-OF-BATTLE DATA" would result in the display like the one in Figure A-4.

- *Transaction Feature*. Preparation of commands for "START DEVICE," "USER MESSAGE," "BULK DATA TRANSFER," and "REMOTE JOB ENTRY.

  Description. Command specification for these four IISS functions is currently accomplished by keying in "switches" which are listed at the bottom of the corresponding MMI "form." (See Figures 9, 13 and 14; as well as subsection 1.1 in the "Analysis" section of this report.)

  Behavioral Implications. The user/operator must remember the function of each of the "switches," as well as procedural model to be followed in filling out the MMI forms. This places an unnecessary memory burden on the user/operator.

  Transactional Implications. Time to complete a command specification may be increased by the necessity for referring to hard copy documents. The probability of error in command specification is increased by the lack of information on switch function and the absence of a procedural context for translating user intent into system commands. This situation has implications for each of the four affected functions:

  Separate consequences are associated with each IISS option:

  1. START DEVICE--the user may be unable to attach a particular device to the IISS system, or the attachment of

```
START A DEVICE (TERMINAL, PRINTER,          CALL UP GIM MENU
ETC.)
STOP A DEVICE (TERMINAL, PRINTER,           TIMESHARE ON H-6000
ETC.)
IDENTIFY CURRENT SYSTEM USERS               TRANSFER BULK DATA
DISPLAY HELP INFORMATION                    ENTER BATCH JOB ON
                                            H-6000
CHANGE CLASSIFICATION AND CAVEAT            CREATE JINTACCS
                                            MESSAGE
CREATE/SEND A USER MESSAGE                  SANITIZE FILES
GENERATE A PLOT                             ENTER TELETYPE MODE
```

Figure A-1. Modified MASTER MENU

```
USE GIM LANGUAGE

PERFORM UTM-GEO CONVERSION

DEFINE REPORT FORMAT

RETRIEVE OR MODIFY ORDER-OF-BATTLE DATA

INPUT ORDER-OF-BATTLE DATA
```

Figure A-2. Modified GIM Menu


```
SELECT AN ORDER-OF-BATTLE FILE FOR ANALYSIS/UPDATE

   ACTF   : ACTIVITY FILE
   ACTIVN :
   ARFLDF : AIRFIELDS FILE
   AUNTF  : AIR UNITS FILE
   EOBF   :
   ESYSF  :
   EUNITS : ENEMY UNITS (GOB)
   INSTF  : INSTALLATION FILE
   MSLF   :
   PERSNF : PERSONALITY FILE
   PLATF  :
   PPTGT  : PRE-PLANNED-TARGET FILE
   RIIF   : REQUEST FOR INTELLIGENCE INFORMATION FILE
   RWYF   : RUNWAY FILE
```

Figure A-3. Analysis File Options

```
SELECT AN ORDER-OF-BATTLE FILE FOR INPUT:
  ACTF   : ACTIVITY FILE
  ACTIVN :
  ARFLDF : AIRFIELDS FILE
  AUNTF  : AIR UNITS FILE
  EOBF   :
  ESYSF  :
  EUNITS : ENEMY UNITS (BOG)
  INSTF  : INSTALLATION FILE
  MSLF   :
  PERSNF : PERSONALITY FILE
  PLATF  :
  PPTGT  : PRE-PLANNED-TARGET FILE
  RIIF   : REQUEST FOR INTELLIGENCE INFORMATION FILE
  RWYF   : RUNWAY FILE

  TRANSLATE
```

Figure A-4. Input File Options

the device may be delayed. This could result in a failure of a qualified, urgently needed analyst being denied or delayed access to IISS.

2. USER MESSAGE--the user may be unable to send a message to a colleague, or transmission of the message may be delayed while the user/operator ascertains how to enter user message commands.

3. BULK DATA TRANSFER--the user may not be able to transmit or receive large quantities of data necessary for accurate intelligence analysis, or transmission of receipt may be delayed.

4. REMOTE JOB ENTRY--the user may be unable to submit batch jobs to the EUCOM AIDES H-6ØØØ, or the submission may be delayed.

Consequences of the Problem. Each of the transactional implications mentioned above may delay production of vital intelligence reports. Command personnel may thus be deprived of data required for battlefield decisions.

Recommended Resolution. The command specification for each of the four functions should be broken into logical steps, so that a consistent set of procedures can be defined for each option. Alternatives in the command specification should be presented to the user/operator in the form of menus. A candidate specification sequence for the BULK DATA TRANSFER option appears in Figure A-5. The level of detail in the available IISS documentation does not permit an exact assessment of the result of the use of the various command "switches;" thus Figure A-5 may not be an accurate portrayal of the most appropriate command sequence. It is, however, an illustration of the kind of sequenced command entry process which would reduce the complexity of the BDT command specification process for the IISS users.

Following a command sequence like that implied in Figure A-5 might entail a series of menus like those depicted in Figure A-6. Again, this example may be incorrect given the actual function of the IISS "switches," but it does illustrate, in general, how the command specification might be performed in a revised IISS system.

Transaction Feature. Specification of RJE commands for the EUCOM AIDES H-6ØØØ.

Description. IISS provides the user/operator with the capability to access the Remote Job Entry (RJE) capability of the EUCOM AIDES Honeywell H-6ØØØ computers. This capability is accessed through the MASTER MENU or TELETYPE modes of IISS. Using the RJE option,

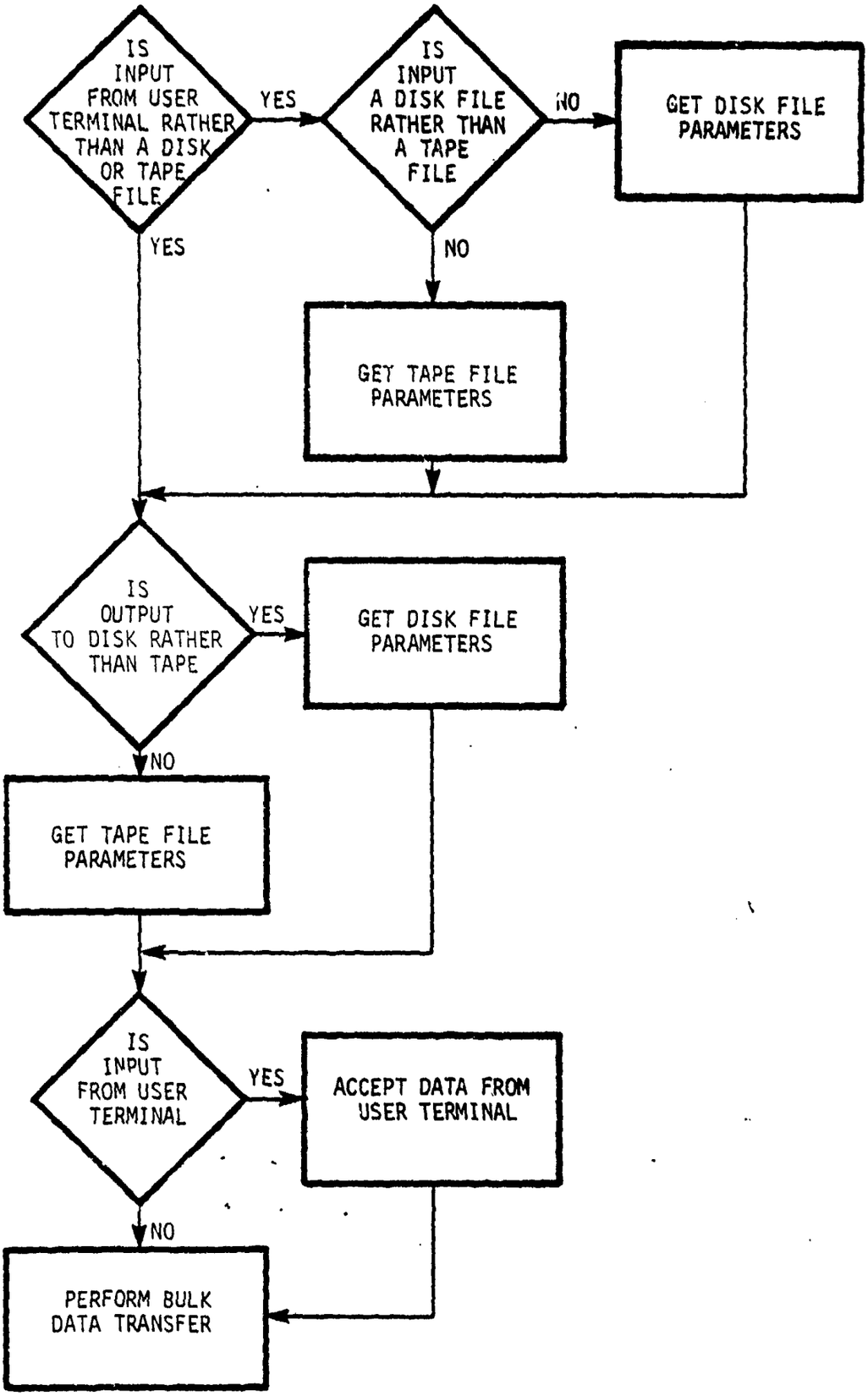


Figure A-5. Candidate Bulk Data Transfer Command Specification Sequence.

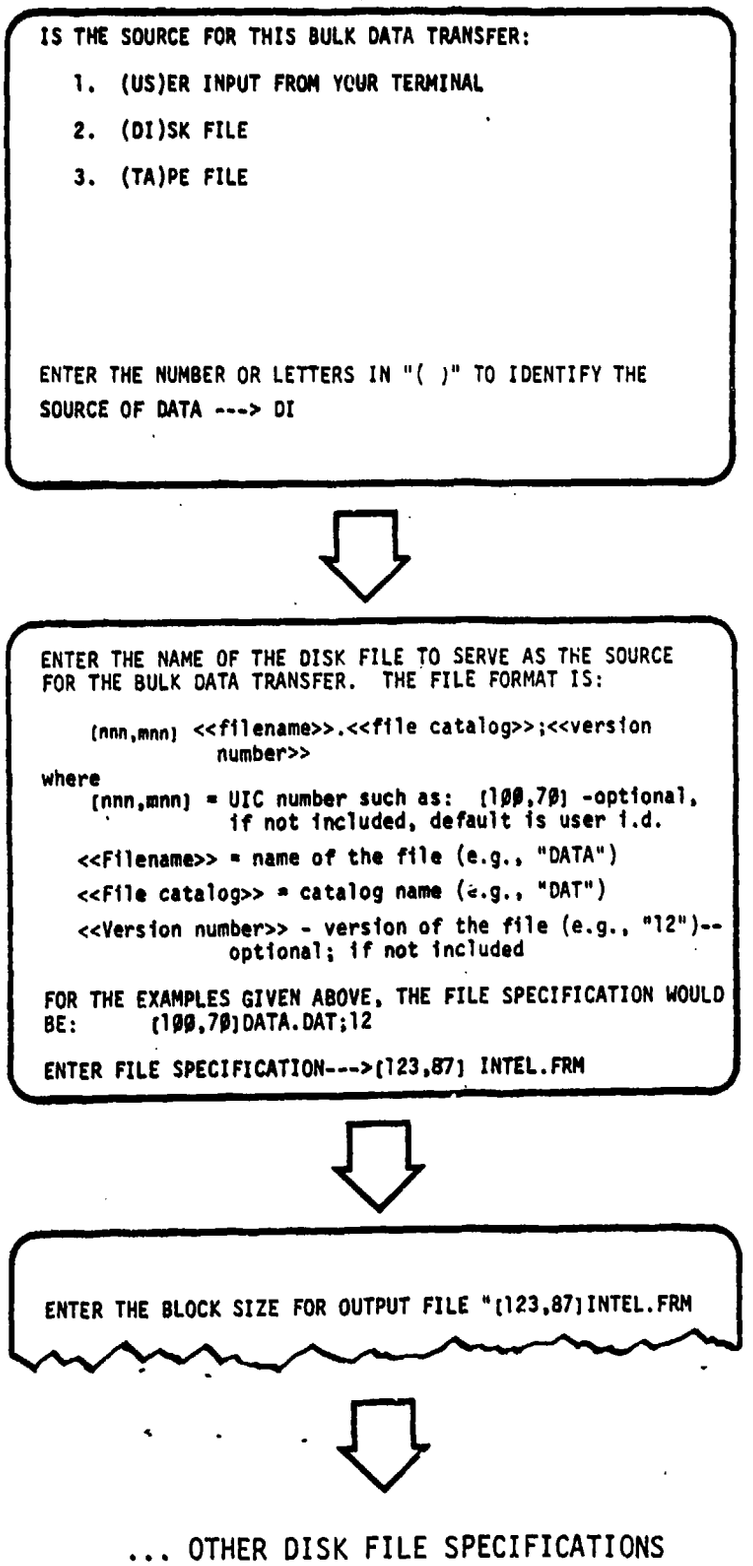


Figure A-6. Example of Menu-Oriented BDT Command Specification Sequence.

the user/operator describes the characteristics of input and output files. To actually define the requirements for the Remote Job Entry however, the user must be familiar with the H-6ØØØ job control language (JCL).

Behavioral Implications. The requirement to learn and recall the H-6ØØØ JCL imposes a significant memory burden on the IISS user/operator. The project team did not have an opportunity to evaluate the H-6ØØØ JCL, but it is unlikely that its grammatical and syntactic structures are similar to those of IISS. Thus, there are likely to be negative transfer effects imposed on the user/operator.

Transactional Implications. The user/operator may fail to specify JCL correctly, thereby receiving erroneous output (or no output) from the EUCOM AIDES computer.

Consequence of the Problem. The intelligence analyst may receive erroneous information because of unfamiliarity with the H-6ØØØ JCL, thus increasing the probability that the battlefield commander will receive erroneous information about the disposition and/or strength of opposing forces. Even if the output is correct, delays caused by "trial and error" specification of H-6ØØØ JCL can delay delivery of critical intelligence information to the commander.

Recommended Resolution. At least two features would greatly enhance the utility of the RJE option to the IISS users:

1. Provide a "front end" in IISS to create H-6ØØØ JCL. This would involve "leading" the user'operator through JCL specification, and would entail providing informative prompts and information on legal values. The "front end" would also query the user/operator about the characteristics of the input file to be operated on by the H-6ØØØ batch routines.

2. Provide a library of frequently used H-6ØØØ JCL "sets." This would eliminate the necessity for typing in the JCL command sets for batch programs which IISS user/operators employ regularly. To use on existing JCL command file, the user/operator would merely use a "front end" such as that described in '1' (above) to specify the file parameters and processing options associated with that batch run.

Transactional Feature. Selection of options from the MASTER MENU and the GIM-II MENU.

Description. To select options from either the MASTER MENU or the GIM-II MENU, the IISS user places the light pen tip over any portion of the term or phase denoting the desired option. The terminal "beeps" to indicate that the light pen is positioned over a valid entry. The user must then press the SEND key to enter the selection into the IISS system. If the user is selecting the GIM-II MENU from

the MASTER MENU, the light pen is used for two selections in a row; otherwise the user enters commands and data using the SU 1652 terminal keyboard.

Behavioral Implications. The user must locate the light pen, position it accurately, note the terminal feedback indicating appropriate positioning, and then press the SEND key to enter the selection. This requires the use of two different command modes, each of which requires the use of different kinesthetic and hand-eye cues. Subsequent interactions require that the user locate the light pen clip, place the light pen there, and then prepare to enter data or commands from the keyboard.

Transactional Implications. The user is required to complete many actions which are not necessary for efficient selection of MASTER MENU and GIM-II MENU options. This may slow users down during high-stress operations.

Consequences of the Problem. The user/operator may become frustrated with the inherent inefficiency of the system interaction, increasing the liklihood that users/operators will react negatively to the use of the system. The inefficiency of the process may also slow down interaction with the system, causing performance and delivery of important intelligence information to be delayed.

Recommended Solution. One minor palliative would be to enable the user/operator to enter the SEND command without using the keyboard. This could be accomplished in one of two ways:

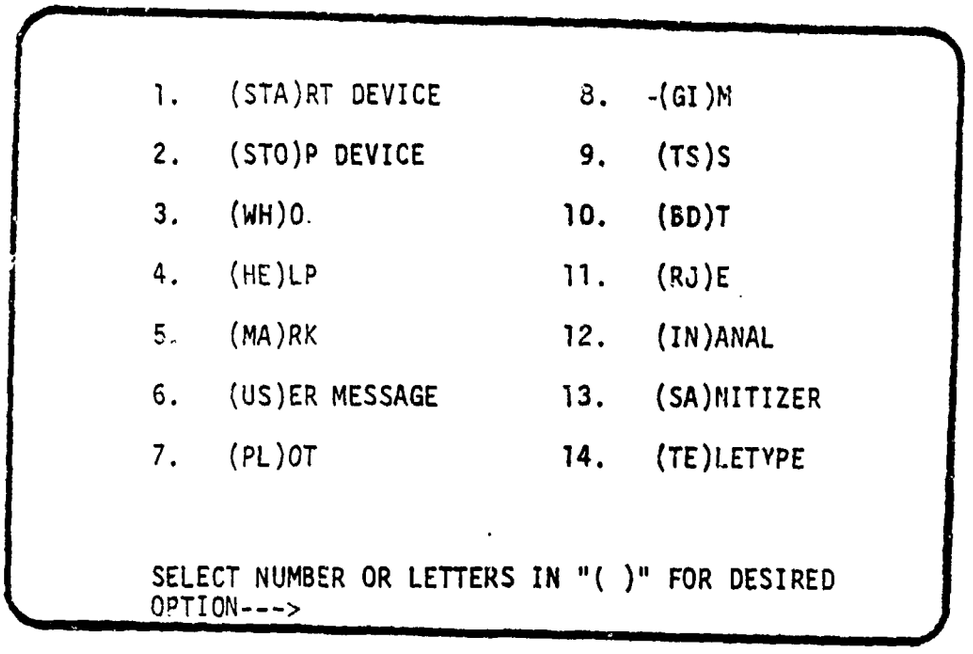
1. Use a depressible tip or button on the light pen to provide a SEND signal.

2. Provide a SEND field on the menu displays which permits the user to light-pen the defined area of the screen to select the SEND command.

Either of these options will make the interaction somewhat smoother, but will do nothing to alleviate the major behavioral discontinuities resulting from the use of two command methods.

A more suitable resolution would be to provide for keyboard selection of menu options. This solution might be implemented for the MASTER MENU as indicated in Figure A-7. Instead of light-penning the desired option, the user would simply enter the number or letters associated with the desired option, and then press the SEND key. To select the USER MESSAGE option, therefore, the user would enter either "6" or "US."

The GIM-II MENU presents a more difficult problem, since the menu selection process is (or can be) a two-step process. It would be possible, of course, to place all of the options on a single menu, but this would result in a somewhat cluttered menu. A better solution might be to break the menu into two parts when necessary. The


1. (STA)RT DEVICE
2. (STO)P DEVICE
3. (WH)O
4. (HE)LP
5. (MA)RK
6. (US)ER MESSAGE
7. (PL)OT
8. -(GI)M
9. (TS)S
10. (BD)T
11. (RJ)E
12. (IN)ANAL
13. (SA)NITIZER
14. (TE)LETYPE
SELECT NUMBER OR LETTERS IN "( )" FOR DESIRED OPTION--->
Figure A-7. Recommended Change in Option Selection for the IISS MASTER MENU.

two parts of the GIM-II MENU are illustrated in Figure A-8. Selection of one of the first three options in the redesigned GIM-II MENU would have the same effect as in current IISS operations--the appropriate menu or prompt appears. Selecting the "analysis" or "input" options would result in the appearance of a new menu, such as that appearing at the bottom of Figure A-8. The user/operator can then select the file desired.

1.3 Function Keys

- *Transaction Feature*. Use of SU 1652 function keys in IISS operations.

  Description. The editing and supplementary operation fixed function keys of the SU 1652 Display Terminal are effectively incorporated in IISS operations. Commonly used editing and other functions are thus employed consistently. Labels on the fixed function keys provide constant prompts to the IISS user/operator.

  Behavioral Implications. Memory loading is considerably reduced. Error liklihood is reduced because of the consistent position and labeling of fixed function keys.

  Transactional Implications. Use of intelligence terminal functions increases the efficiency of main computer operations.

  Consequences. Users/operators are less likely to make errors. Battlefield commanders are more likely to receive on-time information, and are less likely to receive erroneous data.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Use of variable function keys of the SU 1652 terminal.

  Description. Several important IISS functions and subfunctions are accessed through the use of SU 1652 variable function keys. Since the function of individual keys is not changed, these have the same advantages as fixed function keys for experienced IISS users/operators. The lighting behind the key label areas allows an indication of what variable function keys are active at any point in IISS operations.

  Behavioral Implications. The memory burden on IISS users/operators is significantly reduced. The labeling in the SU 1652 key label areas provides constant prompts, and the lighting behind the labeling assures that users/operators will not accidentally attempt to use function keys which are not active.

  Transactional Implications. The use of variable function keys reduces the number of keystrokes required for command selection, thereby reducing command specification. The prompting and "active current option" features of the variable function keys reduces the probability of user/operator errors.

```
                    GIM MENU

          1.   (GI)M LANGUAGE

          2.   (UT)M-GEO CONVERSION

          3.   (RE)PORTW WRITER

          4.   (AN)ALYSIS OF TACOB DATA

          5.   (IN)PUT TO TACOB DATA BASE

     SELECT NUMBER OR LETTERS IN "( )" FOR DESIRED
     OPTION--->
```

```
              ANALYSIS OF TACOB DATA FILES

     AVAILABLE
     AVAILABLE TACOB FILES:

         1.   (EU)NITS              8.   (ACTI)VN

         2.   (AU)NTF               9.   (ACTF)

         3.   (EO)BF                10.  (PL)ATF

         4.   (PE)RSNF              11.  (ES)YSF

         5.   (RI)IF                12.  (MS)LF

         6.   (IN)STF               13.  (PP)TGT

         7.   (AR)FLDF              14.  (RW)YF

     SELECT NUMBER OR LETTERS IN "( )" FOR DESIRED
     OPTION--->
```

Figure A-8. Recommended Changes in Option Selection for the IISS GIM-II MENU.

Consequences. Throughput of intelligence data processing is increased. Battlefield commanders will receive more timely and accurate intelligence information. Users/operators will be more satisfied with the characteristics of user/system interaction.

Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

Transaction Feature. Selection of appropriate function key.

Description. Throughout IISS processing, the user/operator is required to use various function keys to command certain system operations. These function keys are rather tersely labeled. All fixed function keys are operative at any point in IISS operations, while the variable function key labels are lit only when that particular option is allowed. There is no information describing the function of these keys other than that included in the user's and operations manuals.

Behavioral Implications. The user/operator must remember the function of all VFKs and FFKs. The brief descriptors printed on the keys or key labels provide some information, but the memory burden is still large.

Transactional Implications. The user/operator may:

1. Be forced to locate references for the function key in the user's manuals. This requires time.

2. Press the wrong function key, resulting in an error or interruption of the activity in which the user/operator is engaged.

Consequences. Intelligence information required by the battlefield commander may be delayed.

Recommended Resolution. Include HELP displays for FFKs and VFKs. These should be keyed to the terminal activity being performed so that:

1. Only valid VFKs are listed on the HELP displays.

2. The user/operator is made aware of slight differences in function key effects at different points in system activity. (For example, the NEXT PAGE FFK is typically pressed to obtain the next page of a multi-page form. The user/operator should be made aware, however, that pressing the NEXT PAGE FFK when the first page of the SELECTION/RETRIEVAL SCREEN (Figure 24) will result in display of the POLYGON SEARCH form.)

1.4 Prompts/HELPS

- *Transaction Feature*. Field labels in MMI and order-of-battle data retrieval and input forms.

  Description. MMI and data input/query forms contain mnemonic field labels. The user/operator must merely fill in the blanks to specify performance of the desired option, rather than having to recall the classes of information to be entered.

  Behavioral Implications. Memory loading for IISS users/operators is significantly reduced, since the users/operators do not have to remember the data elements in addition to the legal entries for each data element.

  Transactional Implications. Time to enter certain kinds of queries and certain sets of data is reduced, since the user/operator does not have to type in command or data element identifiers.

  Consequences. IISS throughput is increased. Battlefield commanders will receive more timely intelligence information.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Labeling on function keys.

  Description. Fixed function keys have labeling directly on the keys. Variable function keys have labeling in key label areas beside each key. These labels provide essentially constant prompting of IISS functions. The lighting associated with variable function keys refines this prompting even further; variable function key labels are lit only when the associated function key is active.

  Behavioral Implications. A wide variety of IISS function prompts are always available to the IISS user/operator. This reduces the memory burden on the user/operator and allows the formation of consistent perceptual and motor behavioral patterns associated with particular intelligence functions or sequences of functions.

  Transactional Implications. Time to perform IISS operations is reduced because the user/operator need not pause to consider the range of options available at given points in IISS operation. Probability of error is reduced, since the user/operator is less likely to try to use a function which is not valid at a particular point in IISS operations.

  Consequences. Battlefield commanders will receive information which is more timely and accurate.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Obtaining HELP information on IISS legal values and other information.

  Description. IISS provides only a single HELP display (Figure 11), which provides a brief description of the major MASTER MENU and TELETYPE capability of the system. No other HELP information is available on-line (except for function key labels). Explanatory information is available in hard copy but is spread across several documents.

  Behavioral Implications. For IISS procedures and legal values, information which is voluminous and/or rarely used, the user/operator must recall the document and portion of the document where the information is located. The requirement for such recollection entails a significant memory burden.

  Transactional Implications. Performance of IISS activities or entry of data may be delayed while the user/operator consults reference documents.

  Consequences. Delivery of critical intelligence information will be delayed.

  Recommended Resolution. The best resolution is to provide on-line HELP files (see page A-13). If hardware or software resource constraints prevent this, it will be useful to provide an on-line reference to sections of documents providing explanatory information. This reference capability should be keyed to individual displays, so that user/operators do not waste time reviewing an on-line table of contents. The on-line reference capability is schematically depicted in Figure A-9.

- *Transaction Feature*. Presentation of HELP and assistance information to IISS users.

  Description of the Problem. There is only one HELP display in IISS (see Figure 11). This display contains in a very terse manner what the available system capabilities are.

  Behavioral Implications. IISS is an extremely complex system. As such, there are a wide variety of functions and input codes which have to be used by IISS intelligence analysts. Without a well-conceived HELP capability, the complexity of the system imposes significant memory burdens on its operators. They must either commit all of the information to memory or refer to external documents if their recall fails.

  Transactional Implications. IISS does not supply much help information to its users. This either increases the probability of error (if users misremember command or data entry codes) or requires more time (if the user must look up code values in a hard copy reference).

  Consequences. Errors in entering data may result in contamination of order-of-battle files, resulting in providing operational commanders with incorrect data derived from subsequent retrievals from the files.

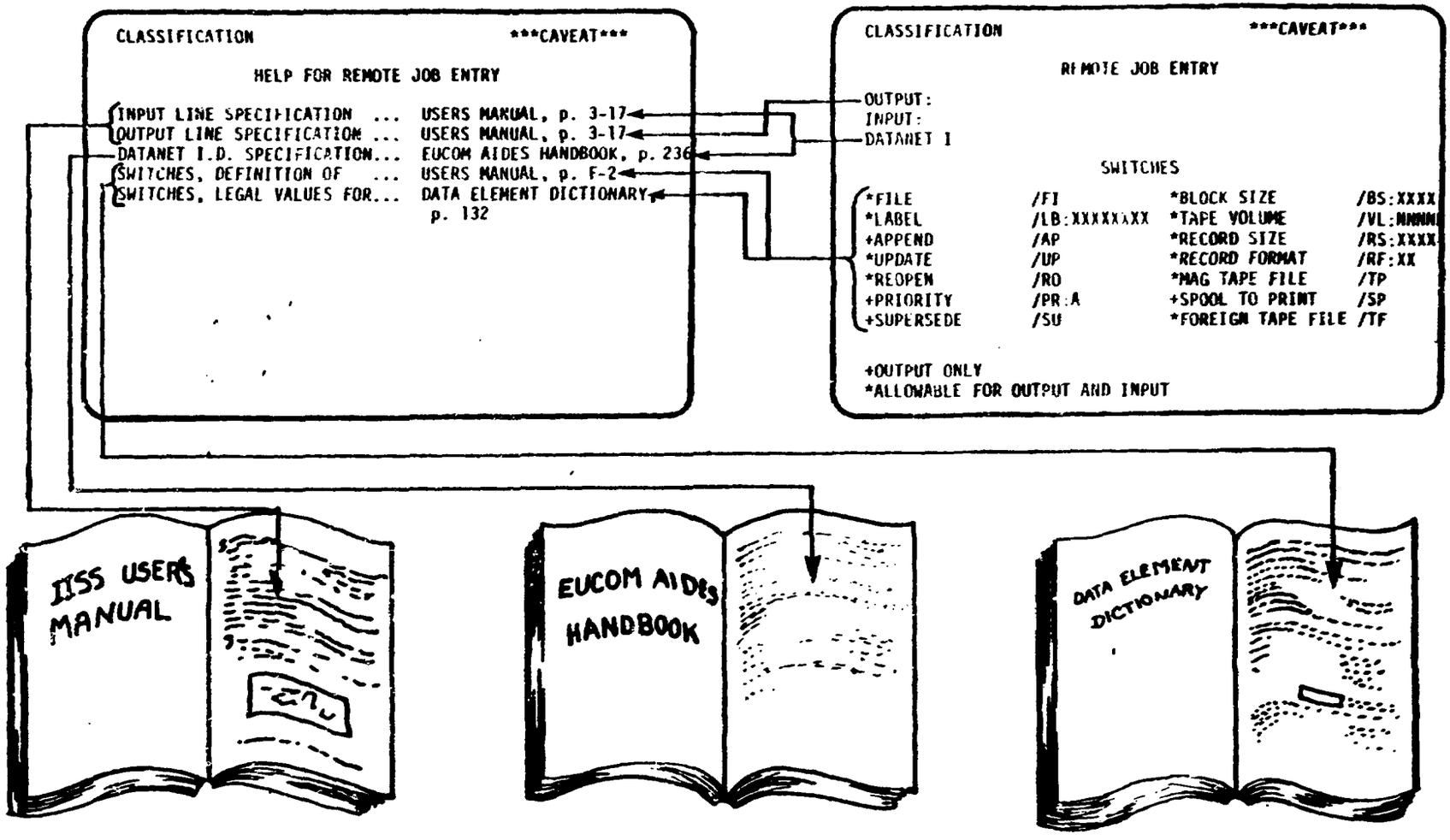


Figure A-9. HELP References to Existing Documentation.

Errors caused by misremembering command codes may result in providing commanders with undesired or erroneous information; they may also cause delays in commanders' receipt of critical intelligence information. The time required to find command or data entry code definitions in documents may also delay delivery of intelligence information to battlefield commanders.

Recommended Resolution. Ideally, all necessary information on command and data entry codes should be made available at the user terminal. For IISS, HELP information should be available for the following kinds of data:

1. GIM command statements (see Appendix F).
2. Switches for MMI forms (see Appendix G).
3. Legal value ranges and codes for data entry.
4. File content and structure.
5. File record elements.
6. Data entry codes.
7. SU 1652 operations, including FFKs (see Appendix B) and VFKs (see Appendix C).
8. GIM command syntax.

The HELP files and displays for these classes of information can be simple or complex, depending on the complexity of the structure of the information. At least three kinds of help information structures are potentially valuable:

1. Single-value HELP displays where the user/operator needs to know only the meaning or application of a single command mode, command, or data element. For example, the user/operator may wish information on the meaning of the STCAT record element in the EUNITS file. To obtain the information, the user/operator could:

   a. Type "H STCAT"; SEND
   b. Type "HELP STCAT"; SEND
   c. Press a HELP function key; type STCAT; SEND

   to receive the HELP display appearing in Figure A-10.

2. Constrained set HELP displays where the user must choose from among a set of available options. For example, the user might wish some more detailed description of the switches available in the USER MESSAGE form (Figure 14). Entering HELP SWITCHES would yield the HELP display depicted in Figure A-11. More information (if any is available) could be obtained by entering a HELP request for an individual switch.

3. Hierarchical HELP displays, required where the user cannot or has not provided enough information to limit the number of HELP displays required to less than 4 or 5. For example, a user who for some reason did not know anything about IISS

```
                                                    PAGE 1 OF 1

DATA ELEMENT:  STCAT

DEFINITION:  STRENGTH CATEGORY OF AN IDENTIFIED OR
  UNIDENTIFIED UNIT

PARENT CATEGORY OF THE FOLLOWING RECORD ELEMENTS
  *PRSAT-----PERSONNEL ASSIGNED
  *FHSTR-----FOXHOLE STRENGTH
  *FHDAT-----FOXHOLE DATE

MULTIVALUED FIELD; MORE THAN ONE ENTRY ALLOWED

LEGAL VALUES ARE:
  * 0 -----
  * N -----   Legal entries should be defined; defi-
  * E -----   nitions not included in existing
  * C -----   documentation
```

Figure A-10. HELP Display for Record Element STCAT.

```
                                                    PAGE 1 of

SWITCH OPTIONS FOR USER MESSAGE FORM

/SI;n --- SPECIFIES SITE NAME; n - SITE NUMBER

/OP ----- CONSOLE OPERATOR TO RECEIVE COPY OF MESSAGE.

/AL ----- ROUTES MESSAGES TO ALL USERS AT THE SPECIFIED
          SITE

/MT ----- SPECIFIES THAT MASTER TERMINAL IS TO RECEIVE
          MESSAGE

/RE ----- MESSAGE TO BE RETAINED FOR USER NOT LOGGED
          ON
```

Figure A-11. HELP Display for USER Message Form Switches.

operations (e.g., someone filling in for a GOB analyst who is unavailable for some reason) might want to review some aspect of system operation without knowing what to call it. Such a user could simply type in HELP, thereby entering the series of displays contained in Figure A-12. The series of HELP displays would "lead" the naive user to the correct set of information.

These types of HELP displays would be useful for each of the eight classes of information listed above.

- *Transaction Feature*. Prompts and HELPS for FFKs and VFKs.

Description. All FFKs and many VFKs are active through IISS operations. There is no on-screen indication of the action of these keys, nor of what keys should be used to what desired ends.

Behavioral Implication. IISS users/operators must recall the action of the FFKs and VFKs, with only the terse labels of the keys themselves as prompts. This memory burden is increased by the fact that some keys have subtly different actions depending on the IISS process being performed. For example, the NEXT PAGE FFK ordinarily brings up the next page of a multi-page message. When the second page of the Selection/Retrieval Screen is displayed, however, the NEXT PAGE FFK yields the Polygon Search form. While this form is used primarily in retrieval of order-of-battle information, it is different in form and function from the rest of the Selection/ Retrieval form pages.

Transactional Implication. The user/operator may forget what commands must be entered to perform desired IISS operations. This may delay system-related activities while the user/operator consults reference manuals.

Consequences. Receipt of critical intelligence information by battlefield commanders may be delayed.

Recommended Resolution. Provide HELP displays which explain in detail the action of FFKs and VFKs. These HELP displays should be keyed to the IISS processes being employed, so that:

1. Subtle differences in the action of FFKs and VFKs may be communicated to users/operators.

2. Only information on VFKs which is valid at particular points in the process will be contained in HELP displays.

Where a particular VFK or FFK is required to complete an action, this information should be automatically presented to the user/operator in the form of an on-screen prompt. For example, the user/operator usually presses the appropriate SEND key to signify completion of operations. When a JINTACCS message has been completed, however, the user must strike the END MSG VFK. This procedure should be indicated on the display screen during JINTACCS message creation.

Transaction Feature. HELP display references.

Description. The single IISS HELP display appears in Figure 11. When the users/operators require some information about the MASTER MENU or TELETYPE options, they simply press the HELP VFK to receive the HELP display. However, the HELP display is somewhat inconsistent with the available IISS processing options:

1. The HELP display includes a reference to a HALT option. This capability is not listed on the MASTER MENU, nor is it discussed as one of the TELETYPE options.

2. The HELP display contains no reference to the SANITIZER option, which is available from both the MASTER MENU (the SANITIZER option) and the TELETYPE (the MMU > CSL option).

3. The HELP display contains no reference to the PLOT option, which is also available in both MASTER MENU and TELETYPE modes.

4. The HELP display includes a reference to a NOTE option, which is not presented in the MASTER MENU nor in the TELETYPE documentation in the IISS Users Manual.

Behavioral Implications. The user/operator will have to resolve the inconsistencies between the HELP display and the manifest capabilities of IISS. This will be confusing, and may lead to hesitancy on the part of users/operators to employ required capabilities.

Transactional Implications. The user/operator may be delayed in implementing a desired IISS function.

Consequences. Production of valuable intelligence information may be delayed.

Recommended Resolution. HELP information and actual system capabilities should be made completely consistent. HELP files should contain references to all system capabilities which are at a similar level of detail and sophistication. The HELP files should contain no information which is not clearly specified as a system capability (e.g., NOTE; HALT).

The existing HELP inconsistencies are not great deficiencies currently, since the presented IISS HELP capabilities are so limited. Consistency will have to be assured if a substantial enhancement of system HELP capabilities is envisioned.

2. DISPLAY FORMAT

2.1 Fixed Alphanumeric Displays

Transaction Feature. Display of geographic coordinates.

Description. Geographic coordinates are displayed by IISS primarily to indicate the position of units in the TACOB order-of-battle files. These coordinates are provided in one or both of two forms:

1. Latitude/longitude (GEO), which has the format:

   ddmmssAdddmmssA
   Lat Lon

   where:

   d = degrees (maximum of two characters for latitude; maximum of three characters for longitude)
   m = minutes
   s = seconds
   A_{Lat} = N (North) or S (South)
   A_{Lon} = E (East) or W (West)

   An example of a GEO display is 354327NØ9728Ø1E

2. Universal Transverse Mercator (UTM), which has the format:

   nnAAAnnnnnnnn

   where:

   n = numeral
   A = alphabetic character

The IISS documentation does not further define the UTM format.

The IISS user/operator is sometimes required to copy geographic coordinates information from one place to another (as, for instance, in UTM/GEO or GEO/UTM conversion).

Behavioral Implications. The user/operator must break the geographic coordinate into its separate subfields (e.g., dd-mm-ss) mentally. The probability of misreading the closely packed characters is thus relatively high.

Transactional Implications. The user may misenter the coordinate, causing an erroneous indication of the position of an enemy unit. Maximum discrepancies between intended (actual) and erroneously entered GEO data are indicated in Table A-1. It should be noted that the probability of GEO data entry error due to confusion with adjacent fields is different for the individual characters of the GEO coordinate. The

	PORTION OF GEOGRAPHIC COORDINATE	MAXIMUM ERROR			AVERAGE ERROR		
		NAUTICAL MILES	STATUTE MILES	KILOMETERS	NAUTICAL MILES	STATUTE MILES	KILOMETERS
LATITUDE	10s portion of degrees . (ddmmssA)		5330			2050	
	1s portion of degrees . (ddmmssA)		622			228	
	10s portion of minutes . (ddmmssA)		57.6			22.4	
	1s portion of minutes . (ddmmssA)		10.4			3.80	
	10s portion of seconds . (ddmmssA)		0.96			0.37	
	1s portion of seconds . (ddmmssA)		0.17			0.06	
	Alphabetic hemisphere indicator . (ddmmssA)	(see Note 1)	(see Note 1)	(see Note 1)	(see Note 1)	(see Note 1)	(see Note 1)
LONGITUDE (at 80° latitude) (see Note 3)	100s portion of degrees . (dddmmssA)						
	10s portion of degrees . (dddmmssA)						
	1s portion of degrees . (dddmmssA)						
	10s portion of minutes . (dddmmssA)						
	1s portion of minutes . (dddmmssA)						
	10s portion of seconds . (dddmmssA)						
	1s portion of seconds . (dddmmssA)						
	Alphabetical hemisphere specification . (dddmmssA)	(see Note 2)	(see Note 2)	(see Note 2)	(see Note 2)	(see Note 2)	(see Note 2)

most important determinant of the liklihood of error of this sort appears to be the clarity of the perceptual "boundary" to which the affected GEO coordinate character can be compared. At least two types of boundaries exist in GEO coordinates:

1. Initiation/termination of the GEO coordinate string.

2. Alphabetical characters designating latitude and longitude hemispheres.

The closer a character is to one of these boundaries, the less likely a character is to be confused with an adjacent one. Given this assessment, the character positions with the highest probability of error are:

1. The "ones" position of minutes for both latitude and longitude.

2. The "tens" position of minutes for both latitude and longitude.

3. The "ones" position of degrees for longitude.

Consequences. Battlefield commanders may receive one or more of the following classes of erroneous information:

1. Incorrect positions of enemy units.

2. Incorrect assessments of the rate of movement of enemy units.

3. Incorrect listings of the number and type of enemy units within n kilometers of a given point (GEO coordinates are entered to indicate center point of a circle search).

4. Incorrect listing of the number and type of enemy units within a region of interest to the battlefield commander (GEO coordinates are entered to define a polygon search).

Such misinformation could severely affect the performance and efficiency of a battlefield unit.

Recommended Resolution. The GEO coordinates should be broken into logical subgroups for display. If a degree sign (°) is available, the following commonly accepted display format might be used:

dd°mm'ss"A ddd°mm'ss"A (example: 35°43'27"N Ø97°28'Ø1"E)

If the appropriate special characters are not available, simply breaking the coordinates into subfields using common delimiters will be beneficial:

dd-mm-ssA dd-mm-ssA (example: 35-43-27N Ø97-28-Ø1E)

Transaction Feature. Display of date information.

Description. IISS currently displays date information in the following format:

YYMMDD (example: 81Ø322 for March 22nd, 1981)

No delimiters are used to separate the year, month, and day subfields.

Behavioral Implications. The date format is different from those commonly employed in either civilian or military practice. This imposes an unnecessary memory burden on the user/operator. Furthermore, the lack of delimiters creates problems in separating the year, month, and day subfields of the date.

Transactional Implications. The IISS user/operator may misread the date. Month and day will be particularly easy to confuse.

Consequences. The battlefield commander may receive erroneous information of one or more of the following types:

1. Date at which information about an enemy unit was last updated.
2. Date at which an enemy unit received training.
3. Date at which an enemy unit changed location.
4. Date at which enemy unit equipment number and type was last evaluated.
5. Date at which enemy unit strength was last evaluated.
6. Date at which enemy unit combat readiness was last evaluated.

Recommended Resolution. At a minimum, delimiters should be placed so as to increase the readability of the date field. For example, dashes might be used to yield the following format:

YY-MM-DD (example: 81-Ø3-22, for March 22nd, 1981)

For maximum readability and decipherability, however, disambiguation of the date subfields should be maximized by converting the "month" subfield into alphabetics. Furthermore, the date format should be changed into one more likely to be familiar to IISS users, such as that used in the date-time-group (DTG).

2.2 Variable-Length Alphanumeric Displays

Transaction Feature. Format of index display.

Description. When using either the GIM-II MENU or GIM-II LANGUAGE methods for analysis of TACOB data, the IISS user/operator first

describes the characteristics of the information to be retrieved. The system then displays the INDEX LIST (illustrated in Figure 17). The available IISS documentation makes no mention of any method for altering the format of the INDEX LIST. The format of the INDEX LIST is apparently fixed, although the length (number of items listed) depends on the number of "hits" (records in accordance with the retrieval specification).

Behavioral Implications. While the information contained in each of the "records" on the index list may be intrinsically of interest to the IISS user/operator, it is often used only to guide the user/operator in selecting a particular item for full record display. The information which should be made available to support this decision process will depend on the intelligence analysis problem on which the user/operator is working. The fixed format of the INDEX LIST may thus force the user/operator to use inappropriate information for making full record review decisions.

Transactional Implications. The user/operator may have to review several "full record" displays of TACOB information before finding one which would have been obvious if a "tailored" INDEX LIST has been available. An alternative would be for the user/operator to use the REPORTW function to generate formatted output, but this requires additional time. In either case, reaching the ultimately desired record will require more time than with an INDEX LIST with appropriate contents.

Consequences. Critical intelligence information may be delayed in reaching battlefield commanders. Moreover, the lack of appropriate information for analytic decision-making may lead to inappropriate intelligence analysis in high-stress situations.

Recommended Resolution. Provide IISS users/operators with some means of quickly selecting an INDEX LIST format. Ideally, these formats would be stored as menu-selectable options, so that individually tailored INDEX LIST configurations will be available for particular analysis situations.

2.3 Graphic Displays

- *Transaction Feature*: Display of results of geographically-ordered searches.

Description. The results of geographically-oriented searches are currently available only as textual listings of unit positions. The PLOT option discussed in IISS documentation is not currently usable by IISS analysts/users. No "on-screen" graphics are provided.

Behavioral Implications. Geographic distribution of units is best represented graphically. Examination of configurations of units and changes in these configurations over time is best accomplished through graphic displays. Even if the PLOT capability were fully implemented and usable by GOB analysts, use of a flatbed plotter for tentative analyses would be wasteful.

Transactional Implications. Currently, users/operators must either generate plots manually or request that plots be generated for them. Either method requires more time than would be necessary for an on-screen plot.

Consequences. Intelligence analysis accuracy or timeliness may be suboptimum.

Recommended Resolution. Utilize the graphics capabilities of the SU 1652 terminal to permit generation of on-screen plots. Rough plots may be generated even without using the graphics capabilities, the 80 x 24 display screen can be used to indicate position to an accuracy sufficient to support many types of analysis, though presentation of even limited topographical information would be difficult.

2.4 Highlighting

Transaction Feature. Highlighting in IISS displays.

Description. As far as can be determined from available IISS documentation, no forms of selective highlighting are used to enhance IISS displays. The SU 1652 terminal has at least the following highlighting capabilities:

1. Reverse video.
2. Brightness control (2 levels).
3. Blinking.

Behavioral Implications. Selective highlighting should increase the speed and accuracy of user/operator identification of particularly important data. Not using selective highlighting techniques in IISS makes it more difficult for the users/operators to quickly determine what portions of displays have the most direct bearing on current interactive tasks.

Transactional Implications. Users/operators will require more time to extract high-priority information from IISS displays.

Consequences. Iniitation of important intelligence processes may be delayed. Receipt of critical intelligence information by battlefield commanders may be delayed.

Recommended Resolution. Employ selective highlighting in IISS in at least the following kinds of situations:

1. Indicate what option has been selected by the light pen prior to user/operator use of the SEND key. (Increased brightness recommended.)

2. Indicate receipt of user message. (Blinking recommended.)

3. Indicate user-selected conditions in output (e.g., authorized equipment above a certain percentage of equipment on hand; units within 50 km. of a particular point).

4. Indicate erroneous portions of input strings. (Reverse video recommended.)

5. Indicate potentially erroneous file entries (e.g., enemy unit of a particular type which has 20 fewer personnel than authorized; location and time data indicating that a particular unit has moved 400 km. in less than a day). (Increased brightness recommended.)

3. DATA ENTRY ASSISTANCE

3.1 Information on Legal Entries

- *Transaction Feature*. Legal values for order-of-battle data entry.

  Description. Legal values for certain elements of order-of-battle file records are not presented to IISS users/operators. Some of these legal values are explicitly stored in GIM-II edit dictionaries.

  Behavioral Implications. IISS users/operators must remember the legal values for all order-of-battle data fields. If they do not remember the appropriate codes, they must look them up in reference manuals. This situation entails an unnecessary memory burden, and may necessitate use of an inefficient job aid.

  Transactional Implications. Misremembering appropriate input codes may result in detection of an input error, necessitating correction of the error before work can continue. The user/operator may also enter legal but incorrect code, resulting in degraded data base accuracy or retrieval of undesired information.

  Consequences. Receipt of intelligence information may be delayed because of data entry errors or time spent in locating legal value information. Incorrect intelligence data may be received by battlefield commanders because of prior entry but incorrect data values.

  Recommended Resolution. Present available legal values which are stored in GIM-II editing dictionaries. These might be stored in HELP files, but a better alternative is to include them in input menus.

- *Transaction Features*. Presentation of legal value information for IISS option switches.

  Description. Two of the option switches used in IISS have a limited number of legal parameter values associated with them. These legal values are not displayed to IISS users/operators. The relevant switches and their associated legal values sets are:

  1. /LB:nn, indicating magnetic tape labeling information, where "nn" may be:

     a. BL = bypass label
     b. SL = standard label
     c. NL = no label

  2. IRF:nn, specifying the record format for output files, where "nn" may be:

     a. VS = variable span
     b. VB = variable blocked
     c. F = fixed length
     d. FB = fixed blocked

In addition to those which have fixed legal values sets, other switch values may be definable at system initialization:

3. /BS, indicating block size for tape or disk files

4. /PR:a, indicating message priority

5. /SI:xx, indicating site designation

6. /VL:n, indicating volume label for magnetic tape

Behavioral Implication. Misremembering appropriate input codes may result in detection of an input error, necessitating correction of the error before work can proceed. The user/operator may also enter a legal but incorrect code, resulting in unintended system processing operations.

Transactional Implications. IISS users/operators must remember the legal values for all switch options. If they do not remember the appropriate codes or values, they must look them up in reference manuals. This situation entails an unnecessary memory burden, and may necessitate use of an inefficient job aid.

Consequences. Receipt of intelligence information may be delayed because of time spent in correcting erroneous switch specifications.

Recommended Resolution. Present legal values for switch options. These might be contained in HELP displays, but a better alternative is to include them in process specification menus.

Transaction Feature. Presentation of switch options.

Description. In the USER MESSAGE, BDT, and RJE forms (Figures 14, 9, and 13 respectively, the user/operator may enter the option switch /FI to indicate that the previous specification is for a file rather than for a user terminal. This switch is used to define either the source or the destination of a particular set of information. The /FI switch option does not appear on any of the forms.

Behavioral Implications. Since the /FI switch does not appear as a listed option, it cannot serve as a cue to the user/operator.

Transactional Implications. The user/operator may not realize that file specification is a legal option, since the /FI switch is not presented in the options portion of the display.

Consequences. Delivery of needed intelligence may be delayed. The user/operator may be induced to use suboptimum procedures for gathering or transmitting information, thus slowing the delivery of intelligence information.

Recommended Resolution. Include the /FI switch as an option on all relevant forms.

3.2 Unburdening of Input

- *Transaction Feature*. Automatic generation of geographic coordinates.

  Description. Many order-of-battle records require the entry of at least three types of geographic location entries:

  1. Geographic (latitude/longitude) coordinates.
  2. Universal Transverse Mercator (UTM) coordinates.
  3. Military grid reference system.

  IISS users/operators are required to enter only one of the first two types of location. The others are automatically generated by the system.

  Behavioral Implications. Time to enter location references for order-of-battle data is reduced, because the user is not required to enter functionally redundant information.

  Transactional Implications. Less time is required to complete order-of-battle record data entry. Probability of error is reduced, since the user/operator will not be required to calculate or transcribe geo-coordinates.

  Consequences. IISS users/operators will not become frustrated by being forced to enter redundant information. Battlefield commanders will receive more accurate and timely intelligence information.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Automatic entry of update date (UDATE).

  Description. The date of all updates to order-of-battle records must be stored in the record. This date is automatically assigned by IISS when udpates are made.

  Behavioral Implications. The user/operator need not enter date of update; fewer keystrokes are thus needed to perform the update.

  Transactional Implications. Less time is required for order-of-battle record updates than would be the case if users/operators were required to enter updates manually. The probability of entry of erroneous dates is reduced to virtually zero, since it is extremely unlikely that IISS hardware and software will make an undetected error in automatic assignment.

  Consequences. IISS users/operators can update order-of-battle records more quickly than would be the case with manual update date entry. Battlefield commanders will receive more accurate and timely intelligence information.

  Recommended Resolution. None required, except as indicated in other Transaction Feature Analyses.

- *Transaction Feature*. Automatic generation of position track for enemy units.

  Description. Five locations and their associated dates are stored for all enemy units in the IISS order-of-battle data base: the current location and date and the five previous ones. When a new location and date are entered, the others are automatically "pushed down" in the list of recent location and time observations. The oldest stored location and date are automatically deleted from the data base.

  Behavioral Implications. IISS users/operators are required to enter only 20% of the keystrokes which would be required if the locations and dates used for the position track were altered manually.

  Transactional Implications. Updates of enemy unit locations can occur up to five times faster than would be required if manual update methods were employed. The probability of creation of erroneous position track information is greatly reduced, because there is no need to manually insert position and date information into their appropriate storage slots.

  Consequences. Intelligence throughput in IISS is increased. Battlefield commanders will receive more accurate and timely information on the current and past locations of enemy forces.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Retrieval string specification.

  Description. Users/operators must use either the MMI or GIM-II language procedures for retrieving a subset of information from order-of-battle data bases. There is no way to store these retrieval specifications for later use. If a user/operator wishes to perform a particular retrieval every day or every week, the specifications must be entered at the terminal each time the retrieval is to be performed.

  Behavioral Implications. The lack of a method for storing and reusing retrieval string specifications forces the IISS users/operators to perform redundant operations.

  Transactional Implications. Reentry of identical retrieval specifications requires more time than would be the case if there were some method for saving the specifications. Forcing the user/operator to enter identical specifications increases the probability of error.

  Consequences. Delivery of critical intelligence information to the battlefield commander may be delayed. Errors in retrieval specifications which are not detected by the IISS users/operators may result in inconsistent intelligence products (i.e., analysts and/or commanders may be comparing information which is supposed to have been derived from the same retrieval specifications, but which actually differ because of errors in retrieval specification).

Recommended Resolution. Provide a method for storing retrieval specifications. This method should include conventions for naming the specifications, as well as provisions for describing the form and application of the specifications in IISS operations.

Transaction Feature. Specification of circle search.

Description. The IISS users/operators must enter the center point of a circle search as geographic coordinates. If command personnel request a circle search around a named place (e.g., town, city, bridge, natural feature, promontory) the user/operator must either look up the point in an appropriate reference or estimate the coordinates from the position of the named place on a map. IISS contains no method for converting from place names to geographic coordinates.

Behavioral Implications. The requirement to convert place names to geographic coordinates forces the user/operator to alter frames of reference in specifying the center point of a circle search. Furthermore, the requirement for estimating or transcription of geographic coordinates increases the liklihood of error in center point specification.

Transactional Implications. The user/operator will require more time to develop the center point geographic coordinates if those coordinates are not stored in association with place names in IISS files. Transcription of geographic coordinates increases the liklihood that center point specification will be erroneous.

Consequences. Delivery of intelligence information to the commander may be delayed. Errors in center point specification may lead the commander to be misinformed about the absolute and relative positions of enemy units or the battlefield.

Recommended Resolution. Provide a means for entering place names as the center points of circle searches. For optimum utility, this capability should include a parser for user specifications of deviations from named places. For example, the user should be able to enter "10 miles west of Berlin," "30 km. SSW of Frankfurt," or "12.3 miles bearing 276 from Dusseldorf" as valid specifications for circle search center points. It would probably be impossible for any system configuration similar to the current IISS to store on-line all conceivable named places in the world. However, the tactical support emphasis of IISS will permit the scope of place names to be constrained somewhat. The focus of hostilities and/or intelligence analysis emphasis could allow the users/operators to further delimit the geographic scope of place name requirements. Place names for a theatre could be stored in some nonvolatile magnetic medium (magnetic tape, disk packs), and the place name files for appropriate areas placed into on-line files, as required.

- *Transaction Feature*. Specification of circle searches.

  Description. The user/operator must enter the geographic coordinates of the center point of a circle search. If the center point of the search is the location of a military unit (friendly or enemy), the user/operator must retrieve the record for that unit and copy the appropriate location specification for the unit into the circle search retrieval form.

  Behavioral Implications. In the situation described above, the user/operator probably has no desire to perform a circle search around some particular point. Rather, the desire is to locate all units or installations which are within n distance units from another unit. The current IISS procedures thus force the user/operator to shift frames of reference in defining the circle search. The present emphasis is more on the geographic coordinates than on the spatial relationships of military units and installations. Furthermore, the need to copy geographic coordinates from one place to another increases the probability of error. It also requires more time than a more flexible method.

  Transactional Implications. The user/operator may make errors in transcribing geographic coordinates. The transcription process requires time.

  Consequences. Delivery of intelligence information to battlefield commanders may be delayed. Errors in transcribing geographic coordinates may lead the commander to be misinformed about the status of enemy units in the vicinity.

  Recommended Resolution. Allow IISS users/operators to enter unit I.D.s, names, or other identifying characteristics as the center points of circle searches. The system would then automatically retrieve the current location of the unit and use this location as the center point of the circle search. This capability would be most useful if the IISS users had access to the designation of friendly units.

- *Transaction Feature*. Designating file names for partially completed JINTACCS messages.

  Description. If the user/operator is interrupted in the process of creating a JINTACCS message, a file name must be provided for the storage of the partially completed message. There is no assistance given to the user/operator in generating this file name. The file name format is not unique to IISS; rather, it is the file name convention used by the Digital Equipment Corporation (DEC), the manufacturers of the AN/GYQ-21(V) computer used in IISS. Failure to use this convention will result in an error.

  Behavioral Implications. The user/operator must remember a fairly complex file specification when the only purpose for using this specification is to provide a basis for completing a message whose generation was interrupted. It is unlikely that there will be a large number of

partially completed messages at any point in IISS operations. A file naming convention simpler than one used by the DEC operating system would reduce the memory burden on the user/operator.

Consequences. Dissemination of important JINTACCS messages may be delayed.

Recommended Resolution. Provide a standard, default file naming convention so that the user/operator need not enter a file name for a partially completed message. For example, messages could be entered as "JNaa.MSG", where "aa" is a two-character alphabetical code assigned in the order in which the partially completed messages were stored. It is unlikely that a given user/operator would have more than two or three messages stored simultaneously, so that users/operators would not be likely to be confused about which messages are which. Note that in this method the users/operators would not have to be aware of the file name at all. Instructing the system to store the messages in partially completed form would cause the system to automatically generate a file name. The user/operator would know that all files of the form "JNnn.MSG" in his UIC contain partially completed JINTACCS MESSAGES.

A more elegant solution would be to include in IISS a "partially completed JINTACCS message menu." This method would list for the user/operator all messages currently stored on a selection menu. The menu would contain information such as message type, time and date stored, addressees, etc. The user/operator would simply select one of the messages from the menu. Using this method, there would be no need for the user/operator to be aware at all of the file name used for message storage; and convention convenient to the user/operator would be deleted from the menu unless the user/operator explicitly directed otherwise.

3.3 Interrupts and Work Recovery

- *Transaction Feature*. Use of dual screen display.

  Description. The SU 1652 terminal used as the primary user terminal in IISS has two display screens. When high priority messages interrupt ongoing intelligence analysis activities, there is no need to erase a portion of the display on which the user/operator is working to provide notification of the high priority event: notification of the high priority message is given on the screen which the user/operator is not currently using. After dealing with the interruption, the user can easily return to the processing on which he or she had been working.

  Behavioral Implications. The memory burden on users/operators is decreased, since there is no need to recall what activities were being performed when the interruption occurred. Partially completed forms, menus, and input screens are left undisturbed. The user can easily resume the activities which were being performed before the interruption.

Transactional Implications. Interruptions in user/operator activities have much less impact on intelligence analysis throughput than would be the case with a less flexible display arrangement.

Consequences. Battlefield commanders will receive timely intelligence information. Users/operators will not be frustrated and annoyed by receipt of high-priority information; and interruptions of other sorts of conversations with other intelligence analysts, for example, will not be likely to disrupt ongoing activities more than is absolutely necessary.

Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Provision for filling out partially completed JINTACCS messages.

Description. If the user/operator finds it necessary to interrupt completion of JINTACCS messages while in IN ANAL mode. the message can be stored in a file. After the user/oeprator has dealt with the interruption, the file can be recalled and the message finished. This feature is particularly useful in situations where the user/operator must use IISS capabilities which employ both of the SU 1652 display screens.

Behavioral Implications. The user/operator will not have to reenter information already placed into the JINTACCS message format.

Transactional Implications. Time to complete JINTACCS messages will be kept to a minimum.

Consequences. Battlefield commanders, other intelligence analysts, and personnel in other services will receive JINTACCS messages as soon as possible. Dissemination of information via the JINTACCS message route will not be delayed because IISS users/oeprators are forced to reenter message contents.

Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Indication that there are messages waiting in the user/operator message queue.

Descriptoin. There is currently no indication that a message has been received by an IISS user/operator.

Behavioral Implications. The user/operator must remember to periodically check the message queue to determine whether or not messages have been received. This produces an unnecessary memory burden.

Transactional Implications. The user/operator may fail to receive a message for some time after it has been received.

Consequences. Important intelligence information or requests for intelligence information may not be received by the user/operator.

Recommended Resolution. Provide an on-screen indication that unreviewed messages are waiting in the user/operator message queue. Provide some means for alerting the user/operator to the fact that the message queue is not empty, such as blinking a "messages waiting" indicator for several seconds out of each minute.

Transaction Feature. Completion of entry of information into partially completed JINTACCS messages.

Description. Creation of JINTACCS messages is supported by forms like those depicted in Figure 16. If the user/operator is interrupted while filling out a JINTACCS message, the partially completed message can be stored in a file. The user can then complete the entry of information into the message at a more convenient time. However, completion of the partially completed JINTACCS message is not supported by the forms which are available when the construction of the messages is first initiated.

Behavioral Implications. The user/operator is forced to remember the format of JINTACCS messages in order to complete them correctly. This imposes an unnecessary memory burden on the users/operators.

Transactional Implications. When required to finish a partially completed JINTACCS message, the IISS user/operator has two options:

1. Attempt to recall the precise format of the message, entering the field labels of the message as well as the data associated with each of those field labels. This process will be slower than "form-supported" JINTACCS message creation, since the user/operator is required to enter significantly more text. It also greatly increases the likelihood of error in data entry, because of both the increased amount of text required and the relatively high probability that the user/operator will not accurately remember the message format.

2. Begin the construction of the message all over again. This will clearly take time, since the user/operator is entering information which has been entered previously.

Consequences. Dissemination of important intelligence information to battlefield commanders, other members of the intelligence community and other services may be delayed.

Recommended Resolution. Permit the user operator to use JINTACCS forms for completion of the message. This capability would place the information already stored in the message suspense file into the JINTACCS form, allowing the user/operator to review the information already entered before completing the rest of the message.

4. MESSAGE COMPOSITION AIDS

4.1 System Design Features

- *Transaction Feature*. Data entry forms for message composition.

  Description. IISS provides "fill in the blank" forms for the creation of user messages and JINTACCS messages.

  Behavioral Implications. The IISS users/operators are not required to remember the format or content of messages: the message blanks presented in the displays provide this information.

  Transactional Implications. The probability of error is reduced, since users/operators will not have to recall the elements which constitute each message. Speed of message composition is increased, since the users/operators do not have to create valid formats during message data entry nor enter field names.

  Consequences. Battlefield commanders, other intelligence personnel, and personnel in other services will receive intelligence information quickly.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Completion of JINTACCS messages.

  Description. IISS users/operators currently complete JINTACCS messages by filling Displayed "forms" like those depicted in Figure 16. These forms provide "prompts" for each item of information which may be entered, but provide no information on legal values for each data entry field.

  Behavioral Implications. The IISS user/operator is forced to remember the legal values for all of the fields in all of the JINTACCS messages, or to look these legal values up in IISS documentation.

  Transactional Implications. The user/operator may misremember the legal values for JINTACCS message fields, thus increasing the probability of error. Referring to IISS documentation for legal values information will require more time than if that information were available in terminal displays.

  Consequences. If errors in JINTACCS messages are detected, creation of a valid message will require more time than if legal values were displayed at the user/operator terminal. This will delay receipt of potentially important intelligence information by battlefield commanders, other U.S. Army intelligence personnel, and/or other services. If the errors are not detected, the appropriate personnel may receive invalid information. Finally, if the IISS user/operator must look up legal values in manuals, transmission of the message will be delayed.

Recommended Resolution. At least two resolutions are available:

1. Providing a HELP capability keyed to the position of the cursor in the JINTACCS message form would allow the user/operator to access legal values information for the data field of current interest. This capability should be coupled with a variable function key permitting the user/operator to call up this tailored HELP information with a single keystroke.

2. Using a menu approach to JINTACCS message creation would automatically provide legal values for each field. If either screen painting time or display content retrieval and transmission time (or the combination of the two) is too lengthy, the experienced user/operator should have the option to inhibit the display of legal value information. Where the legal values list is particularly lengthy, the menu item should be paged. A portion of the JINTACCS form corresponding to the position of the user/operator in the data entry menu sequence should be displayed on the SU 1652 display screen not being used for menu presentation. This will allow the user/oeprator to track the progress and accuracy of JINTACCS message formulation.

The second of these two options is preferrable if screen painting time and display transmission time are sufficiently brief (less than 2 seconds or so).

4.2 Format for Alphanumeric Messages

Transaction Feature. Selection of JINTACCS message type.

Description. When the IN ANAL option is selected from the MASTER MENU, the user/operator is presented with a Dissemination Header form (Figure 22). This is a "fill-in-the-blanks" form, with no information on legal entries.

Behavioral Implications. The user must remember what input values are legal for each data field. This represents an unnecessary memory burden.

Transactional Implications. The user/operator must either look up legal values in reference manuals, or try to recall them from memory. In the latter case, the user/operator may make an error which:

1. Results in an error message and subsequent correction time.
2. Results in dissemination of incorrect information.

Consequences. Message addressees may receive incorrect data. Dissemination of valuable intelligence information to battlefield commanders may be delayed.

Recommended Resolution. A definitive resolution cannot be presented here, because available documentation contained no information about

legal values for JINTACCS messages. In general, however, a menu-driven message input process, utilizing both SU 1652 display screens, would be the preferred method. This method is illustrated in Figure A-13, which includes annotations which highlight design features of the menu. Note that the menu options listed in Figure A-13 are not those which would actually appear; the actual menu options depend on the input requirements and legal values for JINTACCS message formats.

Transaction Feature. Format of JINTACCS messages.

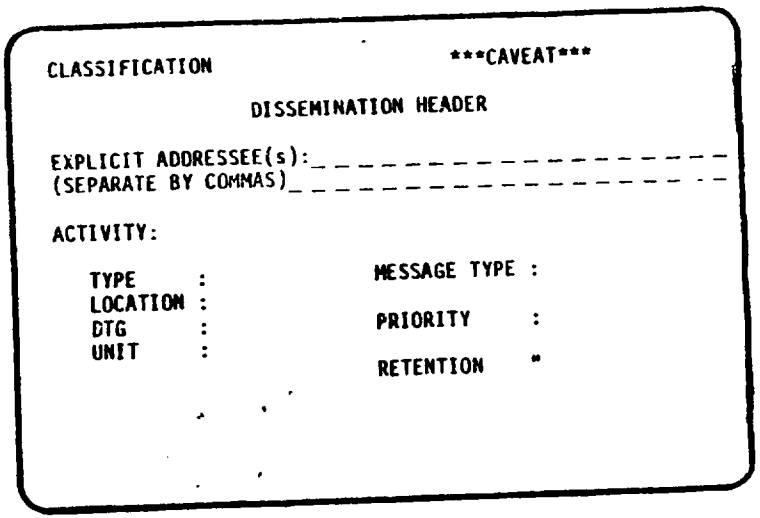
Description. JINTACCS messages are, by definition, joint services communication format standards. As such, they must and do accommodate to the requirements of all three of the major services. Some of the information contained in the JINTACCS format will not be available from U.S. Army sources. Thus, there will be situations in which Army personnel will have no occasion to enter some of the items of information into certain JINTACCS formats. However, the JINTACCS messages forms stored by IISS present the field labels for all of the information which is contained in the JINTACCS format. The IISS user/operator is thus forced to examine and evaluate data fields for which the Army can provide no information.

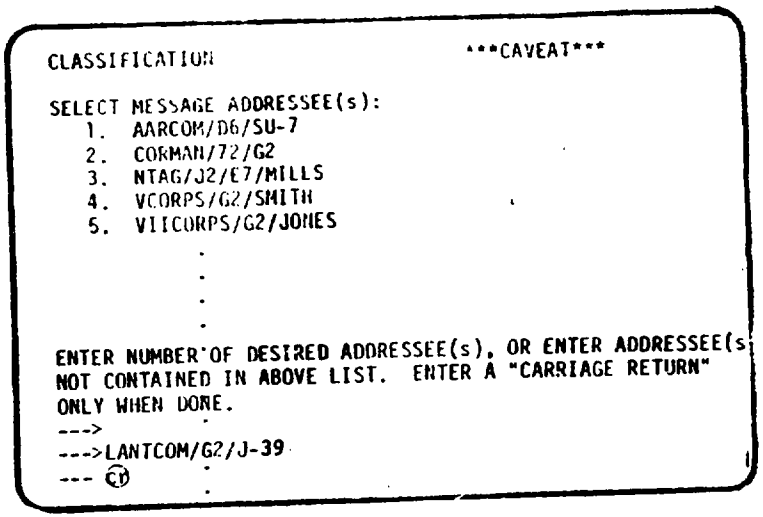
Behavioral Implications. In filling out JINTACCS messages, the user/operator will be presented with field labels for which he or she can provide no valid information. This reduces the amount of useful information which can be presented in a single display, and may tempt an inexperienced user/operator to provide information which he or she is not qualified to provide.

Transactional Implications. The requirement to review field labels which are, for Army purposes, irrelevant may require more time than if only Army-relevant information were included in the JINTACCS forms or menu displays. Furthermore, the probability that data will be entered into the wrong field is increased. The user/operator may also attempt to provide entries without adequate information (i.e., attempt to fill in a data field which IISS users/operators should not complete).

Consequences. Delays caused by errors in filling out the JINTACCS forms may increase the time required to get valuable intelligence information to battlefield commanders. The accuracy of data sets based on JINTACCS messages may be compromised if personnel attempt to provide data which they are not qualified to generate or evaluate. This may lead to data base conflicts and/or confusion among users of these data sets.

Recommended Resolution. Prompt IISS users/operators to enter that information which is available from Army sources. This may be done by "blanking out" extraneous information from data entry forms like those in Figure 16, or bypassing menu items which deal with JINTACCS





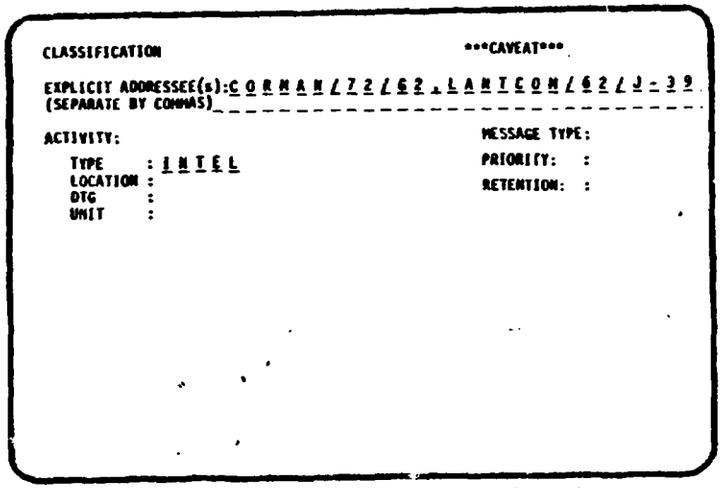
The left screen contains a JINTACCS dissemination header blank, which will be filled in as the user/operator works through the message dissemination header menu items on the right screen.

Here, the user/operator is presented with a list of frequently used addressees. One (or more) of these may be selected, or the user/operator may enter one or more addressees in free text. When the list of addressees is complete, the user/operator types in a carriage return. This informs the system that the list of addressees has been entered.

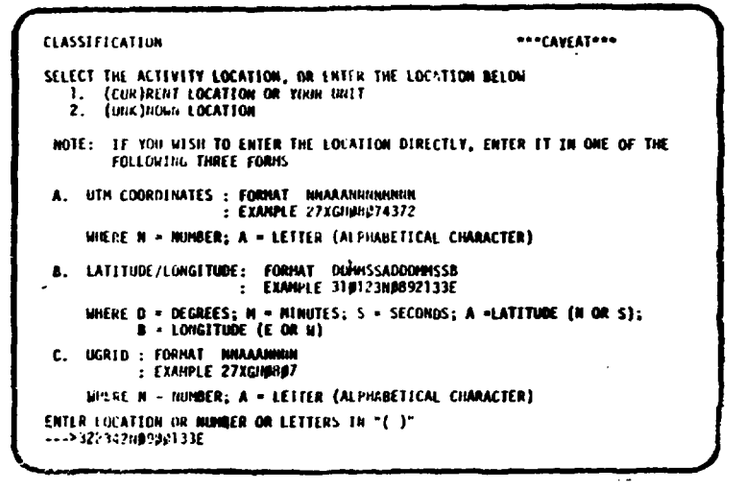
The user/operator should be able to update the stored list of addressees, since it will be different personnel and will change over time.

If the user/operator does not wish to use the menu for header specification, the cursor may be moved to screen area 2. The user/operator may then simply enter the dissemination header directly (as is currently the case in IISS).

Figure A-13. JINTACCS Message Dissemination Header Menus.

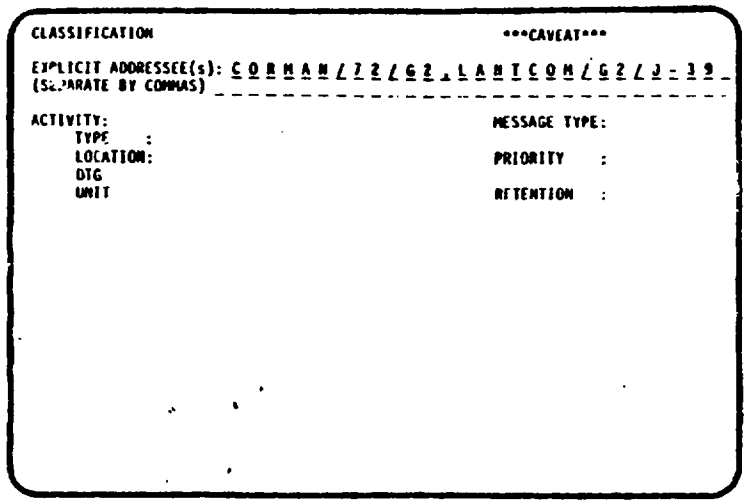


The INTEL code for activity type has been entered according to the user/operator specification in the previous menu item.

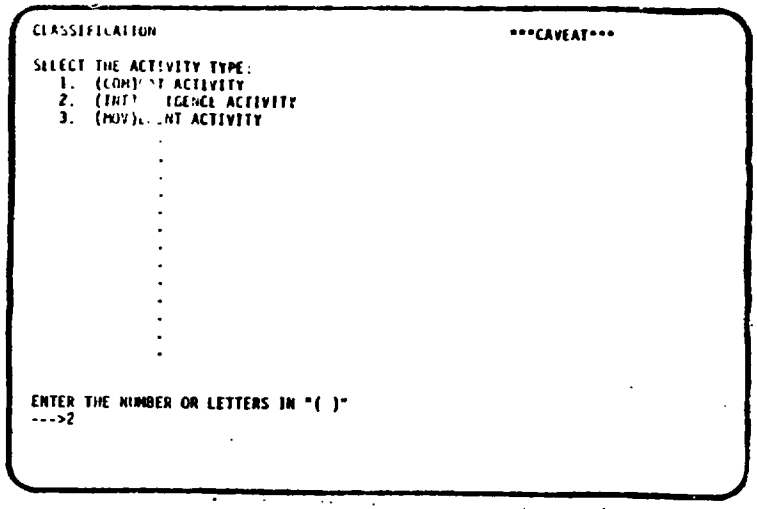


Because there can be no complete menu list of locations, the user is presented with only two menu options. The location can, however, be entered directly. Formats and examples are provided for three methods of location specification.

Figure A-13. Continued

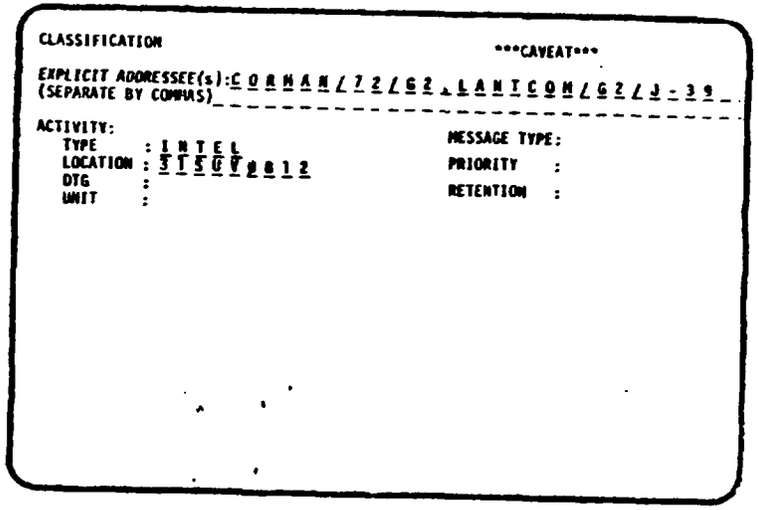


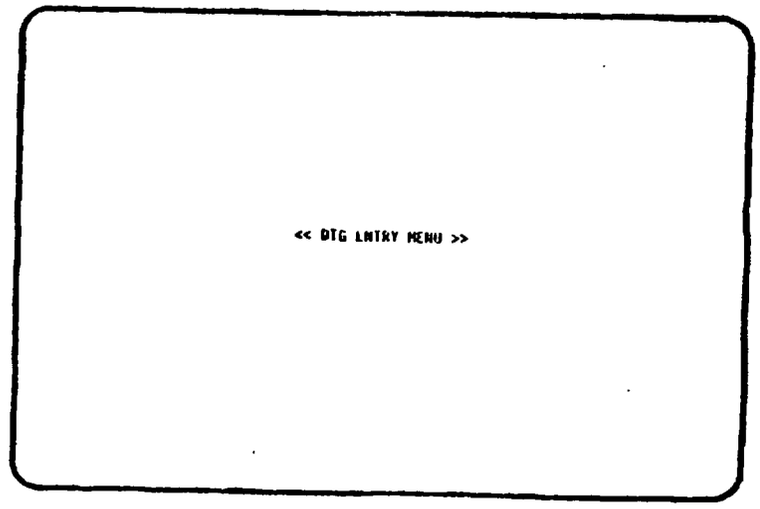
The JINTACCS dissemination header form now contains the addressees as specified in the previous menu.



The user/operator types in a "2" to specify that the activity type is INTELLIGENCE ACTIVITY.

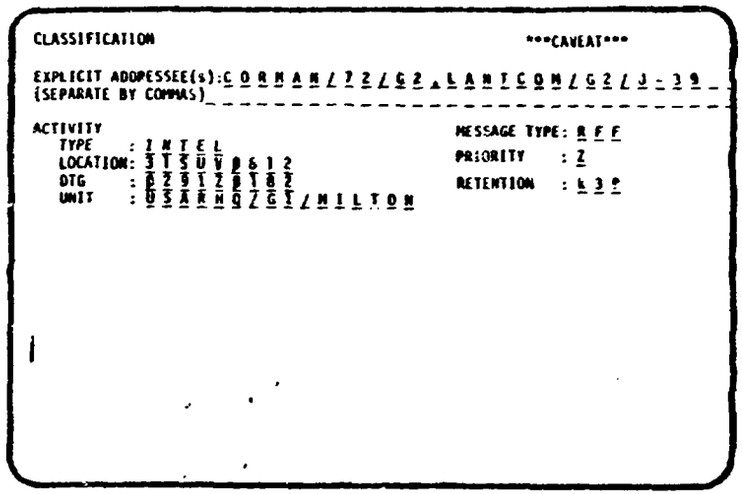
Figure A-13. Continued



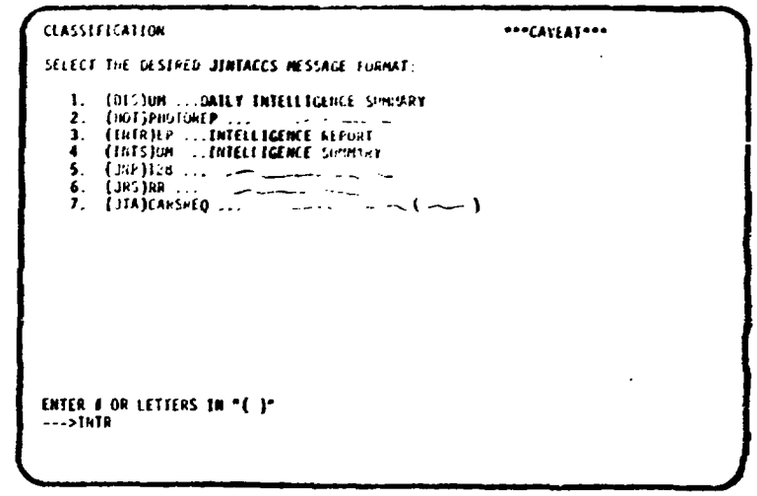


The location reference has been automatically translated to UGRID and entered into the JINTACCS dissemination header form.

Figure A-13. Continued

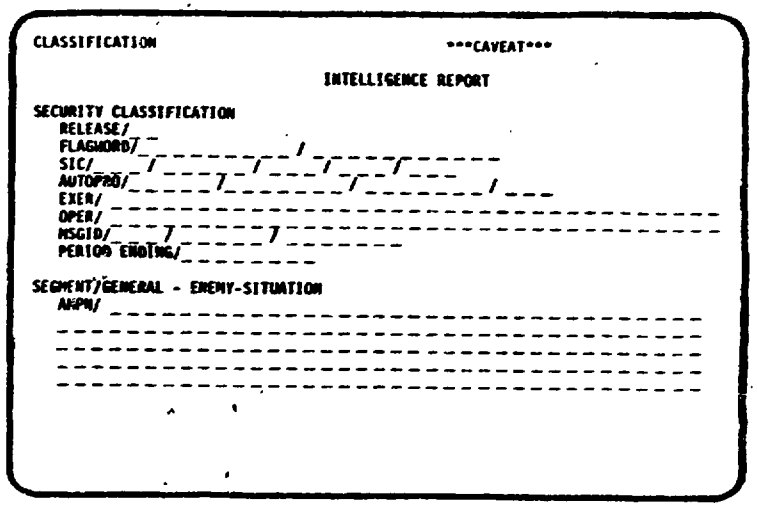


The user/operator has worked down through the form by responding to the prompts and menus presented on the right screen. The JINTACCS dissemination header is now filled out.

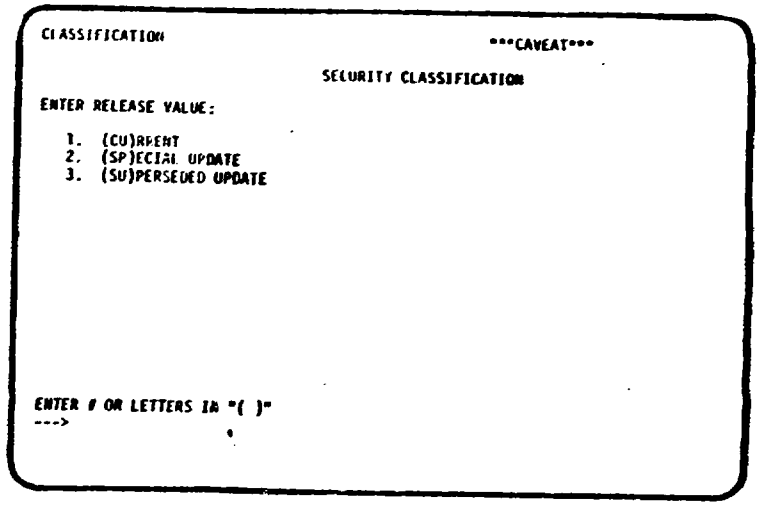


Since the dissemination header has been completed, the system now displays the JINTACCS message format selection menu.

Figure A-13. Continued



The dissemination header form is replaced by the form for the main body of the selected JINTACCS message format.



The menus now permit the user/operator to complete the main body of the JINTACCS message.

Figure A-13. Continued

data fields which are irrelevant to the U.S. Army. It may be preferable to keep the "full JINTACCS message" creation process as an option for situations where:

1. IISS is serving as a relay point for information originally generated by other services.

2. Personnel from other services are interfacing directly with IISS users/operators.

Because JINTACCS messages are to be communicated and received in a standard format, IISS software will have to "regenerate" valid complete JINTACCS formats prior to actual message transmission. This implies the capability of IISS to insert codes for "unknown" or "not applicable" for data fields which would not ordinarily be provided by IISS users/operators.

4.3 Graphic Messages

Transaction Feature. Preparation of graphic messages.

Description. Although the SU 1652 terminals used in IISS are graphics-capable, there are no provisions for sending graphic messages in IISS.

Behavioral Implications. There are situations in which symbols, maps, and charts can convey information more quickly and efficiently than text. The lack of graphics messages within IISS forces the users/operators into modes of behavior which may not be optimum for particular tasks.

Transactional Implications. The user/operator may require more time to compose a text message which conveys the same information as a graphics message. The recipient of text messages may literally have to recreate the graphics message using textual guidance in order to interpret the information which the sender is trying to convey.

Consequences. Delays in generating and interpreting textual descriptions of graphical concepts and phenomena may delay the receipt of critical intelligence information by the battlefield commander. The lack of a graphics message capability may also mean that battlefield commanders cannot receive information in the form which best supports command decisions.

Recommended Resolution. Provide a mechanism for generating graphics messages on the SU 1652 CRT screens, as well as protocols and procedures for transmitting those displays to other IISS user nodes.

5. DATA RETRIEVAL ASSISTANCE

5.1 Query Method

- *Transaction Feature*. Man-Machine Interface query method.

  Description. The IISS user/operator specifies the desired characteristics of a retrieval from order-of-battle data bases by filling out a selection/retrieval form (see Figure 18). "Hits" from this retrieval are listed in the Index List (see Figure 17). If users/operators wish to examine any of the "hits" more closely, they simply light-pen one of the items in the list.

  Behavioral Implications. The memory burden for information retrieval tasks is decreased, since users/operators are presented with a list of the information record elements which may be used to define retrievals.

  Transactional Implications. Time to specify order-of-battle data base retrievals is reduced. Retrievals may be more accurate, since the user/operator is prompted with retrieval parameters which may not have been recalled from memory.

  Consequences. Battlefield commanders will receive information quickly; the contents of intelligence analyses will be better tailored to the commanders' needs.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Determination of distances between two points.

  Description. The TACOB data bases of IISS are geographically oriented. Since the concern of tactical commanders will be with units in the field, rather than those in garrison, "one-time" calculation of distances between points cannot adequately support the commander's need for information about the relative locations of enemy and friendly units. IISS contains no provisions for calculating distances between points directly, even though the circle and polygon search routines must contain all of the necessary mathematical routines.

  Behavioral Implications. IISS users/operators are forced to estimate or manually calculate distances. The IISS system could easily provide this capability.

  Transactional Implications. The IISS users/operators may make errors in estimation or manual distance calculation.

  Consequences. IISS users/operators may be unable to provide accurate information on distances to battlefield commanders. The time required to manually calculate distances may delay communication of this information to the commanders.

Recommended Resolution. Provide techniques for calculating distances in IISS. Different types of distance calculations, varying in complexity, might be provided, including:

1. Point-to-point distance calculations, in which the user/operator would enter two sets of coordinates, and the system would return a distance in appropriate (and user-selectable) measurement scales. This feature would be more useful if the user/operator could enter the name of a unit instead of specifying its coordinate location. The system would then automatically retrieve the most recent reported location of the unit and use that value in its distance calculations. Entry of place names as an alternative to geocoordinate or unit specification would also enhance this capability.

2. Route distance calculations, in which the user would specify a route as a series of connected points. The sytem would then calculate the total distance along a route. This capability would be particularly useful where terrain and transportation system characteristics would not permit ground units to travel in straight lines.

   Specification of the route would be simplified if the user/operator could indicate the route on a map, rather than typing in a series of geocoordinate, unit, or place name specifications. Inclusion of on-line cartographic information which permits the IISS to generate maps on the users/operators CRT screens is likely beyond the capabilities of the current IISS hardware configuration. System enhancements to provide such a capability would probably be extremely expensive, requiring massive upgrades of both hardware and software. An attractive (and relatively inexpensive) alternative would be to provide at least certain users/operators with digitizing tables or tablets and maps of appropriate scales sized to fit onto those tables. The user/operator would then locate the appropriate map, register the map to the table, and stream- or point-digitize the route. The system would then calculate the length of the route.

5.2 Query Structure

- *Transaction Feature*.. Deletion of information from IISS order-of-battle records.

  Description. IISS contains many multi-valued fields in its order-of-battle records. These are fields which can contain more than one value for a particular data element. For example, the list of alternate names (nicknames) for an enemy unit may include "Big Red Two," "Mackvich's Maulers," and "The Sweet Second." If the IISS user/operator wishes to delete one of these names from the data base, the name to be deleted

must be specified explicitly. That is, if the user/operator wishes to delete "The Sweet Second" from the list of alternate names for that unit, the following command string would have to be entered:

FOR IUNITS "MOARMDIV2" DELETE ALTNM "THE SWEET SECOND"

After this deletion, the contents of the ALTNM field for the unit MOARMDIV2 will be "Big Red Two" and "Mackvich's Maulers." If the user/operator fails to specify the item to be deleted explicitly, all of the entries in the specified multi-valued field will be deleted. In other words, if the user/operator enters the command string:

FOR IUNITS "MOARMDIV2" DELETE ALTNM"

the ALTNM field for unit MOARMDIV2 will be blank. If the user/operator did not mean to delete all of the alternate names, the ones which were supposed to remain will have to be added to the data base.

Behavioral Implications. The user/operator must remember that explicit value specification is required for deletion of single items from multi-valued fields. In addition to imposing a slight memory burden, this technique is somewhat inconsistent with the method for deleting items from single-valued fields. Here, the user does not have to explicitly name the value to be deleted because there is only one item in the field. The user may become habituated to using the delete verb without an object. The same process may, of course, result in the inadvertant deletion of items for multi-valued fields.

Transactional Implications. The chance of accidentally deleting items from multivalued fields is increased. If the error is undetected, the integrity of the data is compromised. If the error is detected, the user must reenter one or more items.

Consequences. Other IISS analysts may be unaware that the data base is not accurate. They may attempt to use a multi-valued field as a global search parameter, raising the possibility that a record that should have been a "hit" will not be included in the list of retrieved records. Analysts with update privileges may spend time reentering information to correct inadvertant deletion errors. Commanders may receive incomplete and/or inaccurate intelligence summaries.

Recommended Resolution. Provide a verification step for deletion of items from multi-valued fields. In the example above, for instance, entry of the delete command:

FOR IUNITS "MOARMDIV2" DELETE ALTNM

would result in the following verification message:

YOUR COMMAND WILL DELETE THE FOLLOWING ITEMS FROM FIELD ALTNM:

1. BIG RED TWO
2. MACKVICH'S MAULERS
3. THE SWEET SECOND

ENTER THE NUMBER(S) OF THE ITEM(S) TO BE DELETED, OR PRESS ENTER ONLY TO DELETE ALL OF THE ITEMS --

- *Transaction Feature*. Use of orientation information in TACOB data base structure.

Description. The TACOB data base of IISS does not currently contain any information on the orientation of enemy units (i.e., which direction they are facing in field locations). This information is of interest to GOB analysts who use IISS. Currently, any information on the orientation of enemy units must be stored in the "remarks" section of the enemy unit records. Data in this section are not available as quantitative records for treatment by the GIM-II processing system. The user cannot, for instance, calculate the average orientation of a group of enemy units, nor can the history of unit orientation be conveniently tracked.

Behavioral Implications. The user/operator cannot conveniently use information which is of considerable importance to him/her. Storing orientation data in the "remarks" section of the record forces the user/operator to perform time-consuming and difficult manual analyses. This leads to user/operator frustration and questioning of the value of the automated system.

Transactional Implications. If it is done at all, treatment of orientation data is extremely inconvenient for the user/operator. Analyses of orientation patterns and history require much more time than would be required with automated orientation analysis routines.

Consequences. Battlefield commanders may be unable to receive important analyses of enemy unit orientation. If such analyses are performed, they may arrive too late for the commander to use in battle planning.

Recommended Resolution. Include orientation as a data element in appropriate IISS GOB data bases. Also develop routines for exploiting orientation data in ways that are of maximum benefit to GOB analysts.

- *Transaction Feature*. Route search function.

Description. In some intelligence applications, it is useful to perform a geographic search in a band along a defined line. For exmaple, the GOB analyst may wish to retrieve all records on enemy units within n miles of a particular roadway or waterway. Another possibility is searching along the border of a particular country or other geopolitical entity. IISS provides this capability by allowing users/operators to perform polygon searches. Specifying a polygon search, however, requires entry of twice as many points (geocoordinates or place names) as does the route search function.

Behavioral Implications. The user/operator is required to enter redundant information for certain types of geographic searches.

Transactional Implications. The user/operator will require more time than is required to specify certain types of geographic searches. Since the amount of information to be entered is doubled, the probability of random error is also doubled.

Consequences. Delivery of information to battlefield commanders may be delayed. The probability that the area will have been erroneously defined is doubled; there is, therefore, greater likelihood that the commander will receive incorrect intelligence information.

Recommended Resolution. Add a route search capability to IISS.

6. GLOSSARIES

6.1 Standard Terms

- *Transaction Feature*. Automated creation of data values.

  Description. IISS automatically calculates and/or inserts data values where they are available from stored system information or can be calculated from it. Automatically created data entries include:

  1. Geocoordinates.
  2. Date of update.
  3. Position track information.

  Behavioral Implications. IISS users/operators need perform no activity to ensure entry of this kind of data. Transaction time and error probability are thus minimized.

  Transactional Implications. Probability of error in data and command entry is reduced to virtually zero; no user/operator time is required.

  Consequences. Data base integrity is guaranteed. Time to complete data entry is reduced, assuring battlefield commanders of timely receipt of required intelligence information.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Terminology employed in IISS command languages and menus.

  Description. IISS uses at least three separate command methods: the TELETYPE mode, the MMI forms, and the GIM-II language. In general, the terminology used is consistent. There are, however, some examples of completely different terminology used to designate the same function. For example, the MASTER MENU (Figure 7) uses the term MARK to refer to the capability to change the classification and caveat headers. In the TELETYPE mode, the command HEADER is used.

  Behavioral Implications. The user is forced to remember two different command terms for the same function. This is an unnecessary memory burden, and may lead to confusion.

  Transactional Implications. A user/operator accustomed to one mode of command may look for or attempt to use the familiar command in a different mode. In one case, this command term will not exist. In the other, use of the invalid command will result in an error message. The correct command will then have to be entered to perform the desired operation.

  Consequences. Delivery of important intelligence information to the battlefield commander may be delayed.

Recommended Resolution. Establish and enforce consistency in IISS command terminology.

6.2 Abbreviations and Coding

- *Transaction Feature*. Consistency in command abbreviation and coding.

Description. Command and data entry terms should be consistent to minimize confusion. In general, IISS codes and abbreviations are quite good in this regard. There are, however, some exceptions. In the TACOB record element abbreviations, for example, the term "message" is abbreviated in the following ways:

ABBREVIATION	MEANING
MORIG	Message Origination or Originator
ACMSG	Message
MIDEN	Message Identifier
MGTXT	Message Text

Behavioral Implications. The use of several different methods for creating mnemonic abbreviations will result in dissonant habit formation patterns. This results in an effective memory loading which is much higher than that which would be required to learn a consistently designed set of codes.

Transactional Implications. Inconsistent codes will be more difficult for IISS users/operators to recall, requiring that users access HELP files or refer to IISS documentation. Difficulty in recalling codes is also likely to increase input error rate. The normal difficulty in recalling codes from a large code set is exacerbated by the inconsistency in code sets.

Consequences. The increased error rate caused by inconsistent codes will result in delayed delivery of intelligence information to battlefield commanders.

Recommended Resolution. Establish and maintain consistency in IISS codes and abbreviations.

7. ERROR HANDLING

7.1 Error Prevention

- *Transaction Feature*. Legality of various date formats for entry of order-of-battle date record elements.

  Description. IISS allows its users/operators to use any of seven formats for entry of dates. The first of January, 1981 can be entered in any of the following forms:

  1. January 1, 1981
  2. 1 Jan 1981
  3. 1 Jan 81
  4. 1-1-81
  5. 1/1/81
  6. 1 January, 1981
  7. 1-Jan-81

  Behavioral Implications. The IISS users/operators do not have to remember one particular date format. Date format habits formed in other contexts (civilian experience, other U.S. Army systems, U.S. Army forms, etc.) are likely to be permissible in IISS data entry tasks.

  Transactional Implications. The likelihood of error in date entry is considerably reduced. Less time will be expended in correcting date entry errors.

  Consequences. Battlefield commanders will receive accurate date information in IISS intelligence products.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Indication of data element maximum size in IISS data and command entry forms.

  Description. The maximum length of entries in command and data entry displays is indicated by blanks or "underlines" on the displays.

  Behavioral Implications. Maximum field length information serves as a memory aid for the users/operators, thus reducing the total memory budden.

  Transactional Implications. Errors in command and data entry are reduced.

  Consequences. Intelligence information is received more quickly by battlefield commanders.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

7.2 Error Detection

- *Transaction Feature*. Evaluation of string length.

  Description. IISS evaluates the length of input strings with respect to both minimum and maximum size.

  Behavioral Implications. IISS users/operators need not review data entered to determine whether they meet maximum and minimum length requirements.

  Transactional Implications. The time required to review data entries is reduced. The integrity of the order-of-battle data bases is maintained.

  Consequences. Battlefield commanders will receive more accurate intelligence information.

  Recommended Resolution. None required, except as noted in other Transaction Feature Analyses.

- *Transaction Feature*. Data entry string content evaluation.

  Description. Where the number of possible entries for a given order-of-battle record is small, the GIM-II system determines whether the input value is legal. If not legal, an error message is displayed.

  Behavioral Implications. IISS users/operators need not be concerned about data entry errors for certain classes of input information. The IISS will automatically evaluate the validity of input.

  Transactional Implications. Data base integrity is maintained. IISS users/operators do not have to spend time reviewing some order-of-battle data elements before submitting input to the AN/GYQ-21(V) for data base update.

  Consequences. Battlefield commanders will receive more accurate intelligence information.

  Recommended Resolution. None required, except as indicated in other Transaction Feature Analyses.

- *Transaction Feature*. Error detection in command entry.

  Description. Error correction will be simplified if errors are detected as soon as possible after they are made. In the GIM-II language mode of IISS, for example, the user/operator may enter relatively long command strings. Many of the elements of the command string are standard GIM-II language commands, which are not enclosed in literals (quotes) used to designate data (as opposed to command terms). IISS does not evaluate the command until the entire string is entered.

Behavioral Implications. The user must enter more keystrokes (and thus take more time) to correct errors in command strings which are not evaluated until the entire string is entered.

Transactional Implications. More time will be required to correct typographical errors than would be the case if commands were evaluated for legality as they were entered.

Consequences. Delivery of intelligence information to battlefield commanders will be delayed. Users will be frustrated by the inconvenience of the error detection process.

Recommended Resolution. Evaluate GIM-II language command strings as soon as they are entered. The processing capability of the AN/GYQ-21(V) cannot be used for this purpose, since there is no communication between the SY 1652 and the IISS processors until the entire command line has been generated. The processing capabilities of the SU 1652 might, however, be used for this purpose. Legal values for GIM-II commands could be stored in SU 1652 memory or in local peripheral storage.

7.3 Error Feedback

- *Transaction Feature*. IISS error messages.

Description. The information content of IISS error messages is often quite low. Table A-2 provides some examples of IISS error messages, as well as the actual conditions which caused the error.

Behavioral Implications. The IISS error messages are too vague to permit users/operators to quickly grasp the precise error condition involved. Furthermore, the stilted, formal grammar and syntax of the error messages may make it difficult for the users/operators to interpret the reference of the error messages.

Transactional Implications. Difficulty in interpreting the error messages will increase the time required for error detection and subsequent error correction.

Consequences. Delivery of intelligence information to the battlefield commander may be delayed.

Recommended Resolution. Modify the error messages along the lines suggested in the "Recommended Error Message" column of Table A-2.

7.4 Error Correction/Recovery

- *Transaction Feature*. Error correction for multi-line commands.

Description. The SU 1652 has pure cursor move commands which allow the user/operator to copy information already on the screen. While copying,

Table A-2

IISS Error Conditions, Error Messages, and Recommended Error Messages

ERROR CONDITION	IISS ERROR MESSAGE	RECOMMENDED ERROR MESSAGE
The user/operator has tried to add information to the EUNITS file. This is illegal; information must be added to either the IUNITS or UUNITS segment of the EUNITS file.	7693 This data list not accessible to update.	You cannot add data to the EUNITS file. Please specify either the IUNIT of UUNITS file.
The user/operator has tried to use the SIM-II very ADD to alter the existing current name of an identified unit file. The SIM-II verb CHANGE must be used for this purpose.	1921 In item ID "HAGAV66666" the attribute whose AMC is 4 is a single value reject and already has a value on the file.	You cannot use the ADD verb to change the current name of the identified unit "HAGAV66666." If you want to change it, use the CHANGE verb.
The user/operator has tried to assign a COMBAT READINESS RATING DATE (RRDAT) when there is no COMBAT READINESS RATING stored in the file or entered in the same command line as the RRDAT change.	7214 This statement has failed its edit specification.	You cannot add RRDAT unless (1) there is already a CMBRR in the file or (2) you also add a CMBRR in the same line as the RRDAT addition. There is currently no CMBRR for UUNIT "UN*99999."
The user/operator has tried to enter a new location without also entering a CHANGED LOCATION DATE (CLDAT).	7214 This statement has failed its edit specification	When you add a new unit location (UTMLO or GEOLO) you must also add a change location date (CLOAT).
The user/operator has attempted to add the NUMBER OF DAYS OF TRAINING (NODAY) for a unit without also entering a TRAINING TYPE (TRTYP).	7698 The 02 attribute "NODAY is not directly preceded by its 01.	You must enter the training type (TRTYP) before you enter the number of days of training (NODAY) for that training type.
The user/operator has attempted to add a runway specification to the RUNWAY FILE (RWY) when the runway ID does not already exist in the AIRFIELD FILE (ARFLD).	1849 The secondary ID "7#### 4321-##91#" is a bridge and verify, but is not on the file.	There is no runway ID "7###*4321-##91#" in the airfield file (ARFLD). Please check this runway ID, or add it to the appropriate airfield file entry.
The user/operator has failed to use a legal date format for the Required Information Date (REDAT).	339 Value found for input date conversion not convertible.	You have used an illegal format for the required information date (REDAT). Use one of the following date formats: 1. 1-JAN-81 2. : :
The user/operator has failed to use a legal format for the Activity Addressee (PRADR).	7897 "AA*ENTRY2*R" fails to pass its pattern audit. 7815 Statement terminated due to S/EDIT ERROR	You have used an illegal format for the activity addressee (PRADR). The legal format is: 1. Node...2 characters 2. Analysts function name...10 characters (maximum) 3. Responsibility code...1 character 4. Processing flag...1 character With each item separated from the next by an asterisk (*). Example: "AA*ENTRY1*R*P"
The user/operator has failed to add a line number to the Message (ACMS6) field in the Activity File (ACTF).	7899 WENEEDCOVERFIRE fails to pass its maximum size restrictions. 7819 WENEEDCOVERFIRE fails to pass its mimimum size restrictions. 7815 Statement terminated due to S/EDIT ERROR.	You have used an illegal format for the message field (ACMSG). You must enter a three digit message line number, followed by up to 74 characters of message text. Example: "001*THIS IS LINE 1" "002*THIS IS LINE 2" Separate the line number from the message text with an asterisk (*).
The user/operator has entered a two-character code for the security classification (SECLS) in the Request for Intelligence Information File (RIIF). Only one-character codes are valid.	7899 TT fails to pass its maximum size restrictions. 7815 Statement terminated due to S/EDIT ERROR.	You may enter only a one-character code for the security classification. The legal values are "T," "S," "C," "R," and "U." Your entry of TT is illegal.

the user/operator may also make editing changes to correct errors made in original entry of the command string. When in GIM-II Language mode, the user/operator may at times enter several lines of commands before pressing the SEND key to pass the commands to the AN/GYQ-21(V). If there is an error in the command, the user/operator may use the cursor to recopy the command up to the point where the error occurred, correct the error, and then copy the remainder of the command. It can then be transmitted to the central computer for evaluation. As IISS is currently structured, however, the user/operator must make a change in each line of a multi-line command, even when there is no error in that line.

Behavioral Implications. The user/operator is forced to make irrelevant changes to command lines to ensure eventual acceptance of the commands by the system processor. This process wastes time. In addition, the requirement to make at least one change in all lines of a multiple-line command containing an error is easily forgotten, since the procedure is an essentially illogical one.

Transactional Implications. Correction of errors will take more time than would be required for a better designed error correction procedure. The probability of multiple errors is increased, since the user/operator may forget the seemingly unnecessary requirement to make changes in what appears to be valid command entries. Inexperienced users/operators may not be able to determine why the system refuses to accept seemingly valid commands.

Consequences. Users/operators may become extremely frustrated with the system. Because of increased time to correct errors and the increased likelihood of multiple (sequential) errors, intelligence information may be delayed in reaching battlefield commanders.

Recommended Resolution. Eliminate the requirement for making changes to all lines of multiple-line commands in which there is an error in one of the lines.

APPENDIX B

SU 1652 FIXED FUNCTION KEYS USED IN IISS

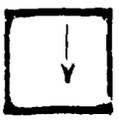
UPPER FIXED FUNCTION KEYS

KEY LABEL		KEY FUNCTION
INSRT	Permits insertion of characters in existing variable fields.	In normal operation, the terminal replaces characters overlaid by the cursor. When the user presses the INSRT key and then enters a character, the existing character overlaid by the cursor is shifted one space and the input character is inserted into the resulting empty space.
NEXT PAGE	Page forward to the next page of data.	Permits the user to page forward to select the next page of data in the SA where cursor is located. There must be more than one page of data in the SA for this FFK to be effective.
PREV PAGE	Page backward to select a previous page of data.	Allows the user to page backwards to select a previous page of data in the same SA where the cursor is located. There must be a previous page of data to the current page being displayed for this FFK to be effective.
LOAD	Allows the internal terminal program to be loaded.	Used in conjunction with the INIT (left FFK). Immediately after depressing the INIT FFK, depressing the LOAD FFK causes the internal terminal program to be loaded. The LOAD key is "on" when beginning terminal operation.

LEFT FIXED FUNCTION KEYS

KEY LABEL		KEY FUNCTION
INIT	Initialize the terminal.	Initializes the user terminal before the LOAD, upper fixed function key is depressed. The INIT key is ON when beginning terminal operations.
CLR FLD	Clear the input field.	Clears (makes blank) the input field indicated by the cursor.
PREV FLD	Move the cursor to the first character in the previous field.	Moves the cursor to the first character in the previous input field in the current SA (screen area).
NEXT FLD	Advance the cursor to the first character in the next input field.	Moves the cursor to the first character in the next input field in the current SA.
SEND	Read the indicated data.	Signals the system computer to read the data in the SA indicated by the cursor and causes the active SA where the cursor is positioned to become inactive.
MARK	Set a position marker.	Place a mark at the cursor position. Two of these symbols identify the start and end position of data to be copied, moved or deleted.

LEFT FIXED FUNCTION KEYS

KEY LABEL		KEY FUNCTION
	Restore one or two marked characters.	At the end of editing, restores the one or two marked characters to their previous values by removing the mark.
	Move the cursor down.	Lowers the cursor one line.

RIGHT FIXED FUNCTION KEYS

KEY LABEL		KEY FUNCTION
COPY	Duplicate data.	Duplicates the data between two marks previously placed. The cursor must be moved to a variable field to receive the data to be copied.
RUB OUT	Delete the character one space to the left.	Erases the character one space to the left of the cursor and backspaces the cursor one space.
NEW LINE	Shift a line down.	Shifts a current line marked by the cursor down one line. Erases the top line and repositions the cursor at the beginning of the input field.
CHAR DEL	Delete the character marked by the cursor.	Deletes the character overlaid by the cursor and moves the remaining characters in the line one space left to fill in the gap.
WORD DEL	Delete the word marked by the cursor.	Removes all of the continuous characters forming the word beginning with the cursor position and ending after the first blank character. //No indication that it fills in.//
LINE DEL	Delete the line marked by the cursor.	Removes the entire line indicated by the cursor and moves subsequent text fields up one line. Fills in the last line with blanks.

RIGHT FIXED FUNCTION KEYS

KEY LABEL		KEY FUNCTION
	Transfer data to another position on the screen.	Transfers data characters between the two marks to another SA beginning at the cursor location and deletes all data between and including the characters marked in the first SA.
	Move the cursor up.	Raises the cursor one line.
	Remove data.	Removes data characters between and including the characters marked.
	Move the cursor left.	Backspaces the cursor one space without erasing data. When held down, backspaces the cursor steadily.
	Move the cursor to "Home".	Moves the cursor back to the first variable character in the current SA. If cursor is at home, depressing the HOME key moves the cursor back to the first variable character in the previous SA.
	Move the cursor right.	Forward spaces the cursor one space without erasing data. When held down, forwards the cursor steadily.

APPENDIX C

SU 1652 VARIABLE FUNCTION KEYS USED IN IISS

RIGHT VARIABLE FUNCTION KEYS

KEY LABEL		KEY FUNCTION
FIRST PAGE	Bring up first display page.	Returns to the first page any time the user/operator is on other than the first page of a multi-page display.
NEXT PAGE	Advance the cursor to the next screen area.	Advances the cursor to the first variable field in the next screen area.
CLEAR SA	Erase the indicated screen area.	Erase the entire screen area in which the cursor is currently positioned.
UNLOCK	Restore key functions.	Restores the alphanumeric keyboard, the Fixed Function Keys and the Variable Function Keys to an operating condition.
COMD LINE	Prepare for command line.	Erases screen area 6 and moves the cursor to the home position in screen area 6 in preparation for an executive level GIM-II command from the user.
RESVT	Reserved (unused) key.	This key is not used in the first milestone system, but is reserved for future use.

RIGHT VARIABLE FUNCTION KEYS

KEY LABEL		KEY FUNCTION
PRINT DISP	Print the display.	Prints all pages of a display in the screen area indicated by the cursor position.
PRINT PAGE	Print the page.	Prints the single, visible page of a screen area as indicated by the cursor position.
LOGON	Log on to the terminal.	Displays the LOGON form in screen area 5.
LOGOFF	Log off of the terminal.	Disconnects the user from the system, blanks five of the screen areas, prompts for a LOGON in screen area six and enables the LOGON VFK.
STOP	Stop processing temporarily.	Temporarily suspends the output stream to the terminal from the statement in progress.
CANCEL	Cancel the statement in progress.	Cancels the statement in progress if possible.

RIGHT VARIABLE FUNCTION KEYS

KEY LABEL		KEY FUNCTION
GO	Resume processing.	Resumes the output stream to the terminal from the statement halted by the STOP right VFK.
STATUS	Display current status.	Requests and displays the current status of the statement in progress.
MASTER MENU	Display the master menu.	Displays the MASTER MENU in screen area two.
HALT	Deactivate the terminal.	Deactivates the user terminal.
CONTROL	Remove the terminal mode.	Removes the terminal mode which was initiated by the user of command DISPLAY ALL#.
MAX PAGE LIMIT	Proceed past the maximum page limit.	This key can be used when viewing the 50th output page. The user pushes this key to continue viewing the next set of pages, but it is not possible to return to the previous set of 50 pages.

RIGHT VARIABLE FUNCTION KEYS

KEY LABEL	KEY FUNCTION
 Interrupt time sharing function.	When in TSS this key interrupts a particular function being performed in time sharing and returns the user to the next level primitive used previously.
 Disconnect from time sharing.	When in TSS this key will cause an immediate disconnect from the host Honeywell 6000 computer and return the user to the master menu.

LEFT VARIABLE FUNCTION KEYS

KEY LABEL		KEY FUNCTION
SELECT FORM	Select user input form.	Displays the appropriate input form to receive user inputs for data retrieval with a structured output format.
SELECT GIM	Display GIM input form.	Displays an input form for the user to enter a selection clause when retrieving dat in the structured format, and displays structured output. For GIM mode only.
UPDATE	Update a GIM field or record.	Can add data to an existing GIM-II field or record, or add a complete record. Can change or replace selected data in a GIM-II field or record. Can delete an entire GIM-I record from the data base.
NEXT ACT	Retrieve the next GIM Activity File record.	Retrieves the next record in the Activity File that has been marked to the attention of a user by the disseminator processor.
APPL RESTR	Return to the beginning of the GIM menu option.	Returns to the beginning of the application (menu option) that the user has selected.
GIM MENU	Display GIM menu option.	Displays the GIM MENU and permits the user to light pen select any menu option present.

LEFT VARIABLE FUNCTION KEYS

KEY LABEL		KEY FUNCTION
END MSG	End JINTACCS formatted message.	Stops construction of a JINTACCS-formatted message when conducting the IN ANAL menu option.
INDEX LIST	Return to the INDEX LIST.	When pressed while the user is working with a full record display, this key returns the display to the Index List so the user can select another record.

APPENDIX D
DISCUSSION OF SOFTWARE ELEMENTS IN IISS RELATED TO USER/OPERATOR TRANSACTIONS

INTRODUCTION

The IISS FMS is a highly complex intelligence support ADP system. As such, many of its software capabilities are appropriately reserved for use by system operations and maintenance personnel. The discussion here will be limited to software capabilities with which the primary system users (i.e., USAREUR GOB analysts) interact.

GENERAL STRUCTURE OF IISS FUNCTIONAL CAPABILITIES

The general structure of IISS functional capabilities is depicted in Figure D-1. Following a successful logon, the user is presented with the IISS MASTER MENU (Figure D-2). Using this menu, all analyst-relevant IISS capabilities can be selected by touching the light pen to the desired function. The functions available from the MASTER MENU include four which are restricted (i.e., they may or may not be available to individual users, depending on their position and status). These four restricted options are:

1. START DEVICE--used to start (logically connect) a currently inactive IISS hardware device.

2. STOP DEVICE--used to stop (logically disconnect) an IISS hardware device which is currently active.

3. SANITIZER--used to strip classified information from reports and datasets which must be transmitted over non-secure data lines and/or reviewed by personnel without required security clearances.

4. PLOT--used to plot installation or order-of-battle data derived from TACOB data base.

There are also ten options which are available to all IISS users:

1. WHO--used to determine what IISS users are currently logged into the system.

2. HELP--prints a brief list of options in IISS processing.

3. MARK--enables the user to change the security classification and caveat appearing at the top of each CRT screen.

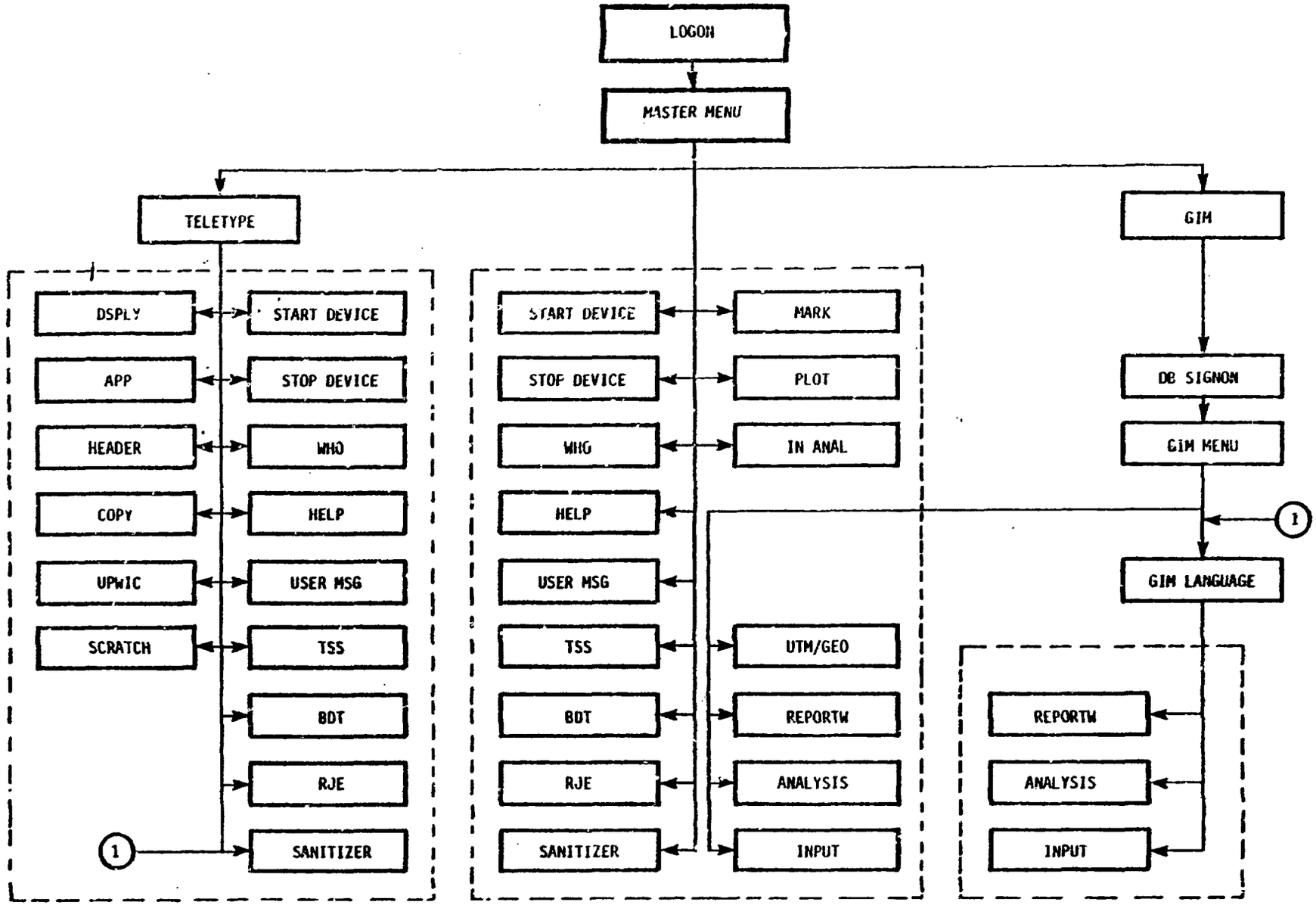
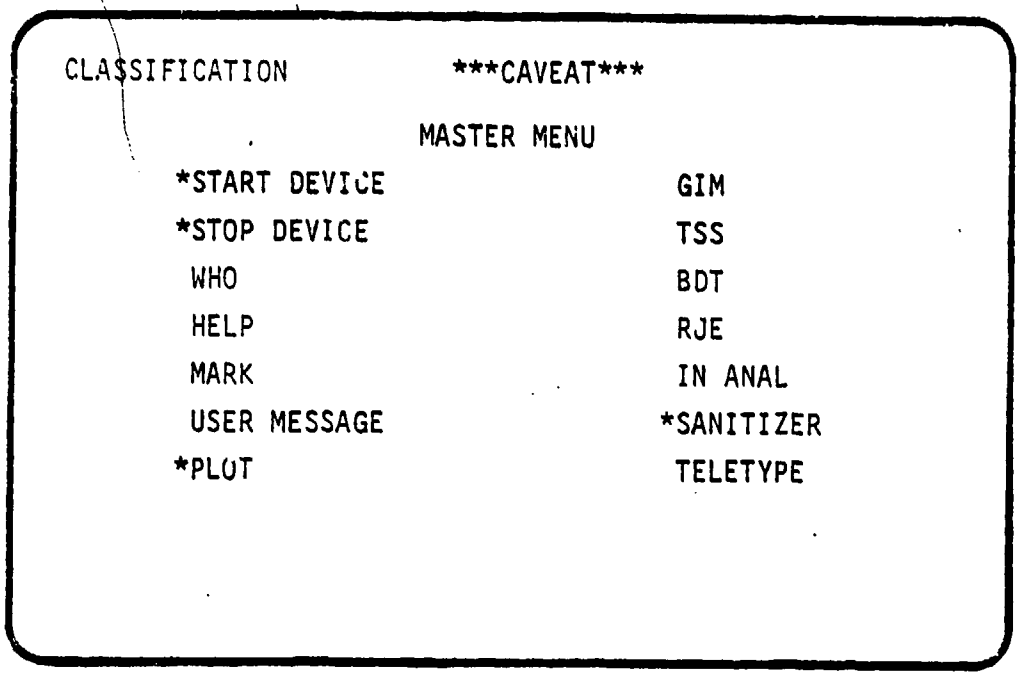


Figure D-1. General Structure of IISS Functional Capabilities.



*Restricted options

Figure D-2. MASTER MENU of the IISS. Redrawn from *IISS User's Manual*, p. 3-5.

4. USER MESSAGE--allows IISS users to send messages to other users.

5. GIM--used to query and update data bases via the Generalized Information Management (GIM) menu and language systems.

6. TSS--allows the IISS user to communicate directly with the EUCOM AIDES Honeywell H-6ØØØ host computer.

7. BDT--permits the IISS user to define and control bulk data transfer from node to node.

8. RJE--permits IISS users to execute remote job entry batch jobs on the Honeywell H-6ØØØ host computer.

9. IN ANAL--permits IISS users to create messages in Joint Interoperability Tactical Command and Control System (JINTACCS) format.

10. TELETYPE--permits IISS users to bypass informative form displays and itneract directly with the PDP-11/7Ø system monitor/executive to perform IISS operations.

When selecting any of the options (other than TELETYPE), the user is presented with an informative prompt/form generated by the IISS Man-Machine Interface (MMI). Using the light pen and alphanumeric codes entered from the keyboard, the user fills out the form and/or light-pens appropriate words to further define desired processing.

If the TELETYPE option is selected, IISS no longer presents the user with MMI-generated informative prompts. In this mode of operation, the user keys in a command to perform the desired IISS function. The system then responds with informative feedback on the result of the command entry. Many of the functions described earlier in connection with the MASTER MENU are also available in TELETYPE mode:

1. START DEVICE

2. STOP DEVICE

3. SANITIZER

4. WHO

5. HELP

6. MARK

7. USER MESSAGE

8. GIM

9. TSS

10. BDT

11. RJE

In addition to these options, the TELETYPE mode provides some capabilities which are not accessible through the MASTER MENU. These include:

1. APP--simulates the interface of an external application program.

2. COPY--copies input statements to an output location when the terminal device number is unknown.

3. UPWIC--establishes digital communication with IDHSC-II lines.

4. SCRATCH--scratches an entry from a designated user queue.

5. DSPLY--displays data routed to a print queue.

Most of the options in the MASTER MENU are "single-purpose" options. That is, they lead invariably to stipulation of a single set of processing commands with no significant procedural "branches." To put it another way, selection of most MASTER MENU options does not lead the user to another menu but rather to a form to be filled out to define further processing. The GIM option (as indicated in Figure D-2) is an exception to this general rule. Upon exercising the GIM option, the user is first requested to sign on to (specify) a particular GIM data base. This done, the system then displays the GIM MENU, which provides the following five options:

1. GIM LANGUAGE, which in a manner analagous to the TELETYPE option of the MASTER MENU, permits the user to bypass the detailed command entry forms of the MMI and interact directly via the GIM query language with the IISS system.

2. UTM-GEO CONVERSION, which permits the user to convert between Universal Transverse Mercator (UTM) and latitude/longitude geocoordinate systems.

3. REPORTW, which permits the user to define the format and content of brief, *ad hoc* reports.

4. ANALYSIS, which permits the user to query the TACOB data base.

5. INPUT, which permits the user to add to and/or modify the contents of the TACOB data base.

The functions of all IISS options, as well as the display screens and internal switches associated with the functions, are described in more detail below.

MASTER MENU OPTIONS

Options from the MASTER MENU are selected by touching the SU 1652 light pen to the portion of the CRT screen containing the desired option, and then pressing the SEND key. This will result in one of the following types of system responses:

1. A form to be filled in to determine subsequent processing or provide IISS inputs.
2. A prompt character or string indicating that a command string should be entered.
3. A display of user information.
4. Another menu.
5. A prompt for non-SU 1652 terminals.

If a user accidentally selects an undesired option (or if the user has completed activities associated with a particular option), the user can press the MASTER MENU VFK to return to the MASTER MENU.

Discussions of individual MASTER MENU options appear below.

Start a Hardware Device (START DEVICE Option)

Selecting the START DEVICE option, i.e., logically connect a hardware driver, results in the display in Figure D-3, which appears in Screen Area (SA) 5. This option is ordinarily reserved for use by the Data Base Manager or other designated personnel. The START DEVICE option is used to logically connect any peripheral device currently physically connected and "mapped into" the IISS hardware/software system (terminals, tape drives, printers, disk

drives, etc.). This option would ordinarily not be used by an OB analyst/ user unless there were a particular need for user control over a system device.

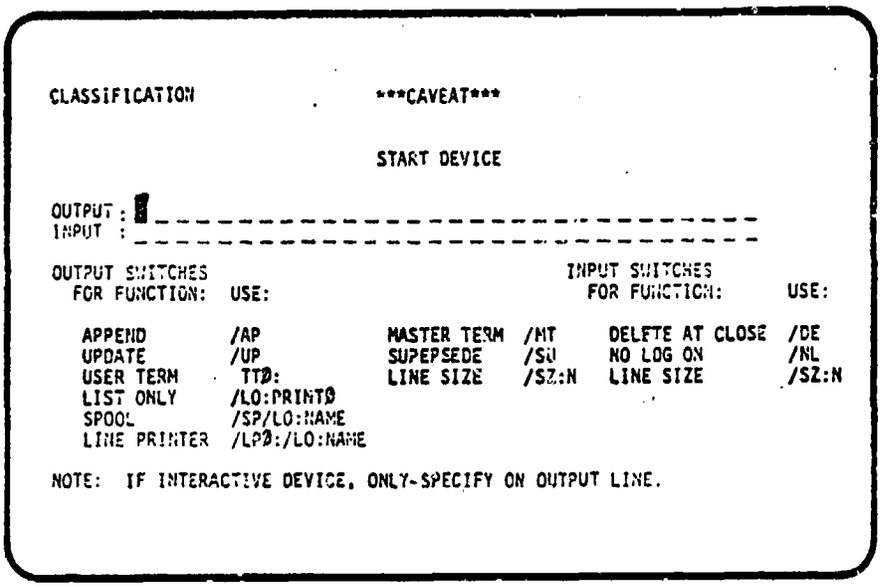


Figure D-3. Format of the START DEVICE Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-6.

To start a device, the user types in specifications for output or input devices. Interactive devices are specified only on the OUTPUT line of the display. In specifying device and device connection parameters, the user may use one or more of the following switches:

1. /AP--specifies that BDT or RJE output should be routed to the existing specified file.

2. /UP--indicates that the existing version of the output file is to be updated.

3. /LO:PRINTØ--specifies a list only (output only) device; used to start a device which prints directed output.

4. /SP/LOS:<<name>>--indicates that output is spooled to directed output.

5. /LPØ:/LO:<<name>>--line printer.

6. /MT--indicates that the specified device is to be assigned as the master terminal.

7. /SU--indicates that an existing version of the output file is to be superseded; version number of file must be explicit.

8. /SZ:N--specifies an override line size for input or output file.

9. /DE--indicates that the input file is to be deleted at close.

10. /NL--indicates that the soft device is not to be logged on; specification must contain logon name and password.

When the form is completed, the user presses the SEND key to enter the information into the system. The system will then automatically return to the MASTER MENU.

Logically Disconnect a Device from IISS (STOP DEVICE Option)

This option is the counterpart to the START DEVICE option; it logically disconnects a physical device currently attached to and "mapped into" the IISS system. Selecting the STOP DEVICE option cuases the display in Figure D-4 to appear in SA 5.

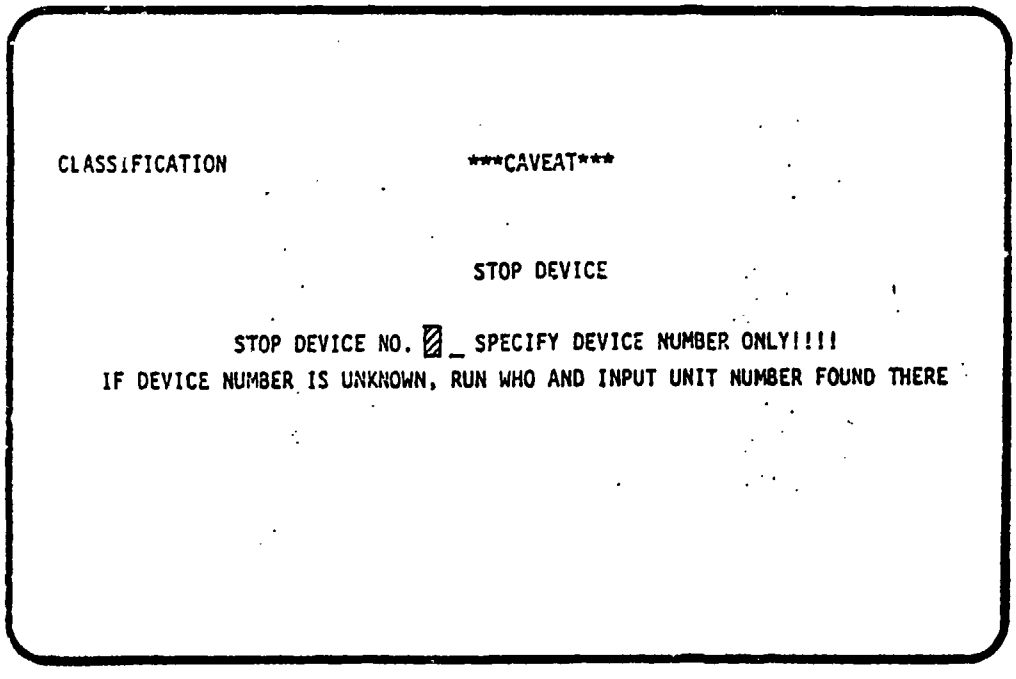


Figure D-4. Format of the STOP DEVICE preformatted display. Redrawn from *IISS User's Manual*, p. 3-7.

The designated user (this is a restricted option) types the device number (logical unit number) into the appropriate blank on the form. If the user does not know the device number, it may be identified by exercising the WHO

option from the MASTER MENU. Once a device has been STOPPED, all system users will be prevented from using it until a START DEVICE command has been issued. There are no option switches associated with this option.

Sanitize File Contents/Output (SANITIZER Option)

This option is used to delete sensitive material from IISS files and output so that it may be 1) transmitted via non-secure communications systems and/or 2) reviewed by uncleared personnel. Since the original data were supplied from a data base containing highly classified intelligence information, however, they must be reviewed by appropriate security personnel whether or not they have been processed by the SANITIZER software. This option is not currently used by IISS analysts, and therefore will not be further discussed here.

Plotting Installation and Order-of-Battle Data (PLOT Option)

This option was intended to provide IISS users with the capability to extract geographically-defined data from order-of-battle files and to plot the positions of the extracted items. It is not currently provided as a user option; plots are generated by the highly experienced and qualified system operators/developers. Therefore, the PLOT option will not be further discussed here.

Identify IISS Users (WHO Option)

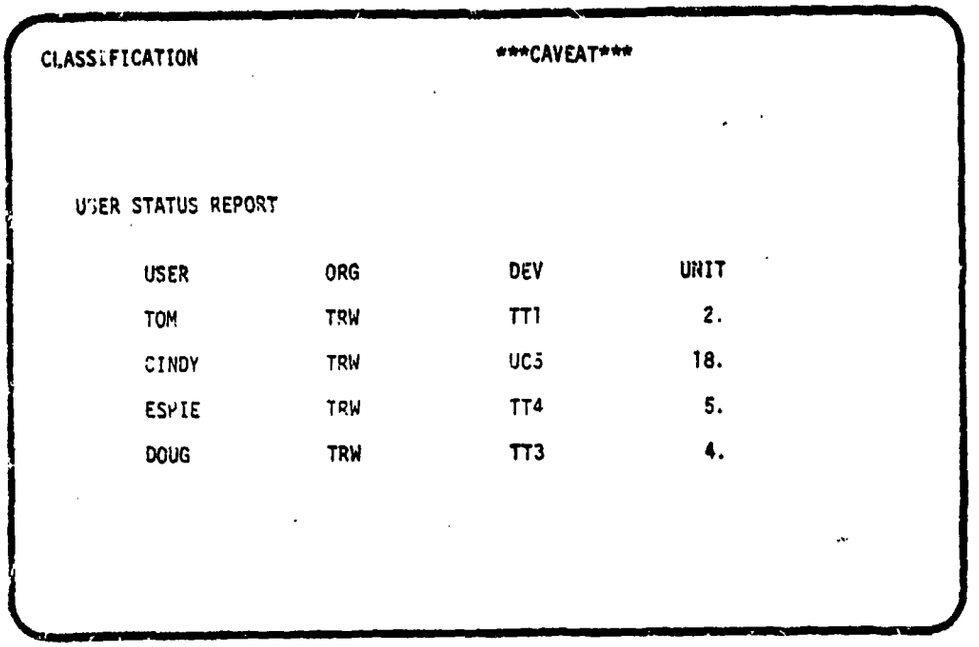
Ana Analysts can determine who is currently logged on to the IISS system by exercising the WHO option. This results in a display formatted like that shown in Figure D-5.

Request a List of User Options (HELP Option)

Selecting the HELP option results in display of one line descriptions of IISS functions available. The display (shown in Figure D-6 appears in SA 5.

It should be noted that this display lists some options which are not selectable through the MASTER MENU:

1.	COPY	COPY INPUT TO OUTPUT
2.	DSPLY	DISPLAY VERB ENTRY POINT FROM MENU
3.	HALT	LOGOFF AND HALT TERMINAL



CLASSIFICATION ***CAVEAT***

USER STATUS REPORT

USER	ORG	DEV	UNIT
TOM	TRW	TT1	2.
CINDY	TRW	UC5	18.
ESPIE	TRW	TT4	5.
DOUG	TRW	TT3	4.

Figure D-5. Format of the User Status Report (WHO) Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-7.

4. HEADER — ALTER SECURITY HEADER (note: this appears to be accomplished by the MARK option in the MASTER MENU).

5. LOGOFF — LOG OFF

6. MSG — SEND MESSAGE TO USER LOCAL OR REMOTE (note: this appears to be identical to the MASTER MENU USER MSG option).

7. NOTE — COMMENTS, NO OPERATION

8. PRINT — PRINT VERB ENTRY POINT FROM MENU

9. SCRTCH — SCRATCH VERB ENTRY POINT FROM MENU

Also, there are MASTER MENU options which are not included in the HELP listing:

1. MARK
2. USER MESSAGE
3. TERMINAL
4. PLOT
5. SANITIZER
6. TELETYPE

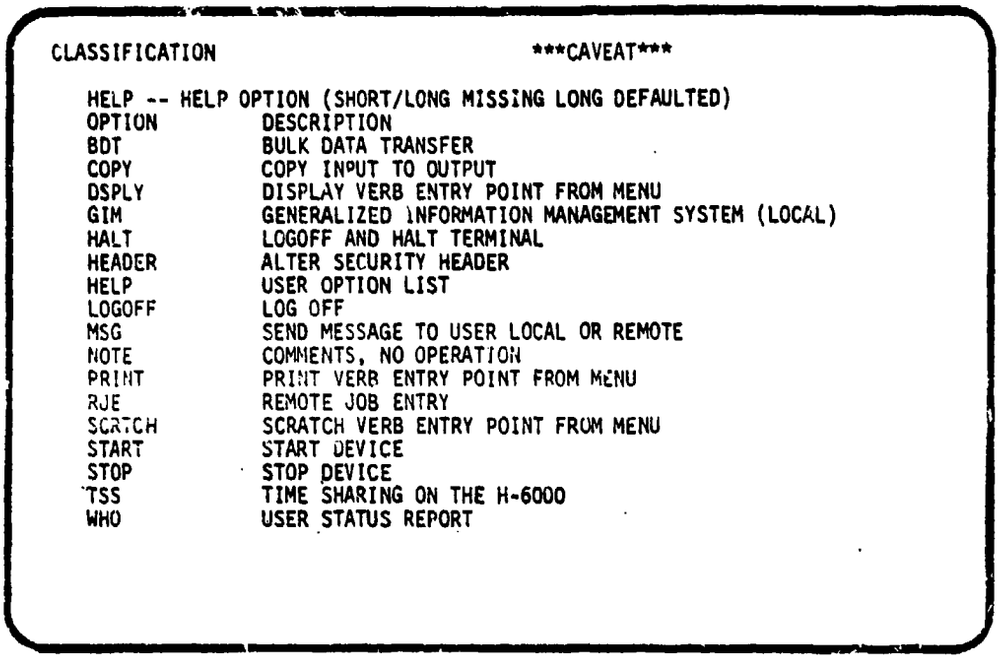


Figure D-6. Format of the HELP Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-8.

Change in Security Header Line (MARK Option)

Selecting this option causes the classification marking form (Figure D-7) to appear in SA 5.

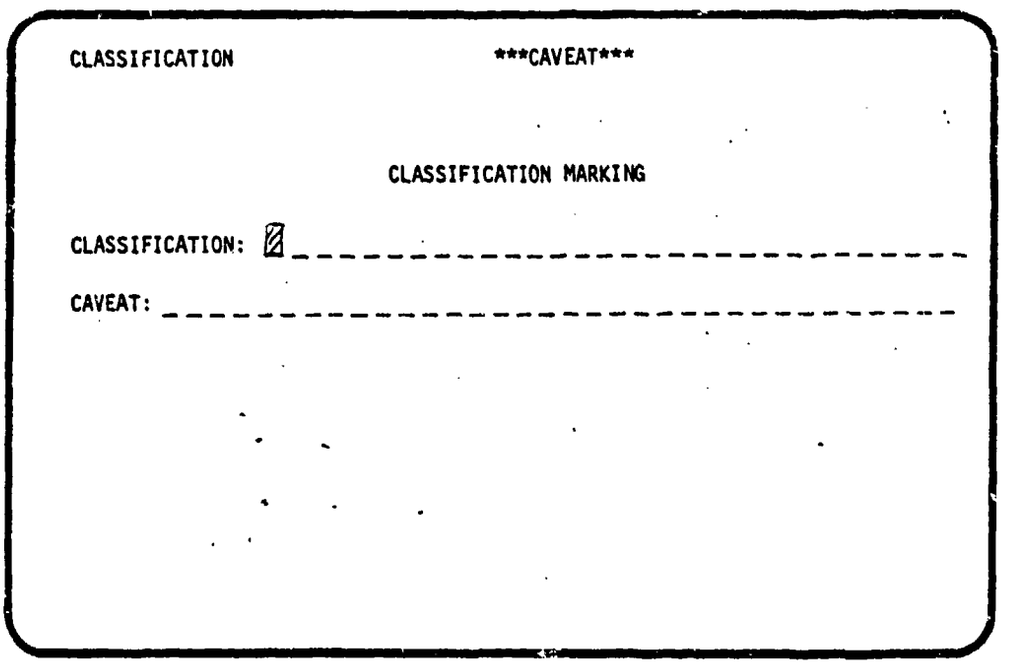


Figure D-7. Format of the Classification Marking (MARK) Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-9.

The user then types the classification and caveat into the appropriate portion of the form. The new classification header then appears in SAs 1 and 4 for the remainder of the terminal session. During the session, the analyst/user is responsible for ensuring that the classification header is consistent with the classification of data being used.

Send Message to Other Users (USER MESSAGE Option)

IISS allows its users to send messages to other users who are logged onto the IISS system. Users initiate this capability by light-penning the USER MESSAGE option on the MASTER MENU. The results in display of a user message form (Figure D-8) in SA 5.

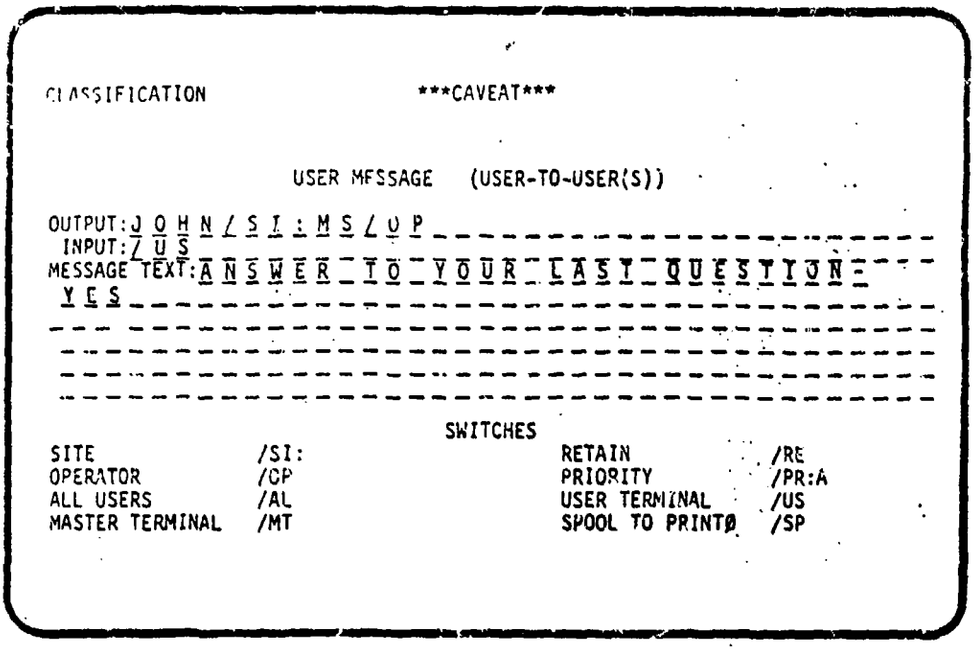


Figure D-8. Format of the USER MESSAGE Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-10.

The user controls message dissemination and retention by filling in the appropriate blanks of the message, including use of message creation switches listed at the bottom of the form:

1. /SI:--identifies the site to which the completed message is to be sent.

2. /OP:--specifies that the console operator at a particular site is to receive the message.

3. /AL--indicates that all users at the specified site are to receive the message.

4. /MT--indicates that the MASTER TERMINAL at the specified site is to receive the message.

5. /RE--indicates that the message should be saved for a user not currently logged on to IISS.

6. /PR:--specifies the message priority assigned by the user.

7. /US--indicates that the input will come from the user terminal.

8. /SP--indicates that the message is to be spooled to the printer.

Incoming messages are displayed in SA 3. The timing of the incoming message display depends on the priority of the message. Low priority messages appear when the recipient completes work on the current statement or menu option. High priority messages interrupt current processing. Users may move the screen cursor to SA 3 to page through multi-page messages, or to print the message on an appropriate hard copy output device.

Connect to GIM Language Capabilities (GIM Option)

Selecting this option results in a system request to sign on to a GIM data base (Figure D-9). Completing this signon results in display of the GIM menu. Since there are many complex capabilities contained on this menu, discussion of GIM options and interaction is contained in a separate subsection beginning on page .

Connect to EUCOM AIDES H-6ØØØ (TSS Option)

Selection of the TSS option causes page 1 of the Honeywell Signon dialogue form (Figure D-10) to appear in SA 2, and page 2 of that form (Figure D-11) to appear in SA 5. The user fills out page 1 of this form to gain access to the H-6ØØØ Time Sharing System (TSS); the validated user entries appear on page 2. This option cannot be employed by users who are not familiar with TSS interaction language, since no information on TSS procedures is available in IISS. Two variable function keys on the SU 1652 are allocated specifically to TSS activities:

1. $*BRK interrupts H-6ØØØ output to the SU 1652.

2. $*DIS disconnects the Honeywell H-6ØØØ program in progress.

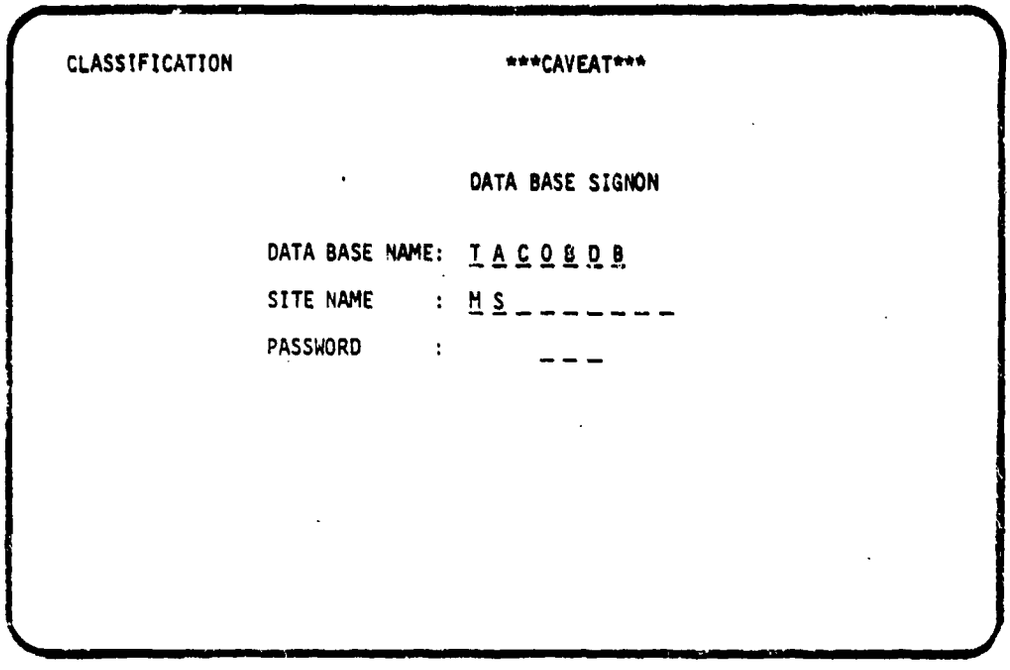


Figure D-9. Format of the DATA BASE SIGNON Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-35.

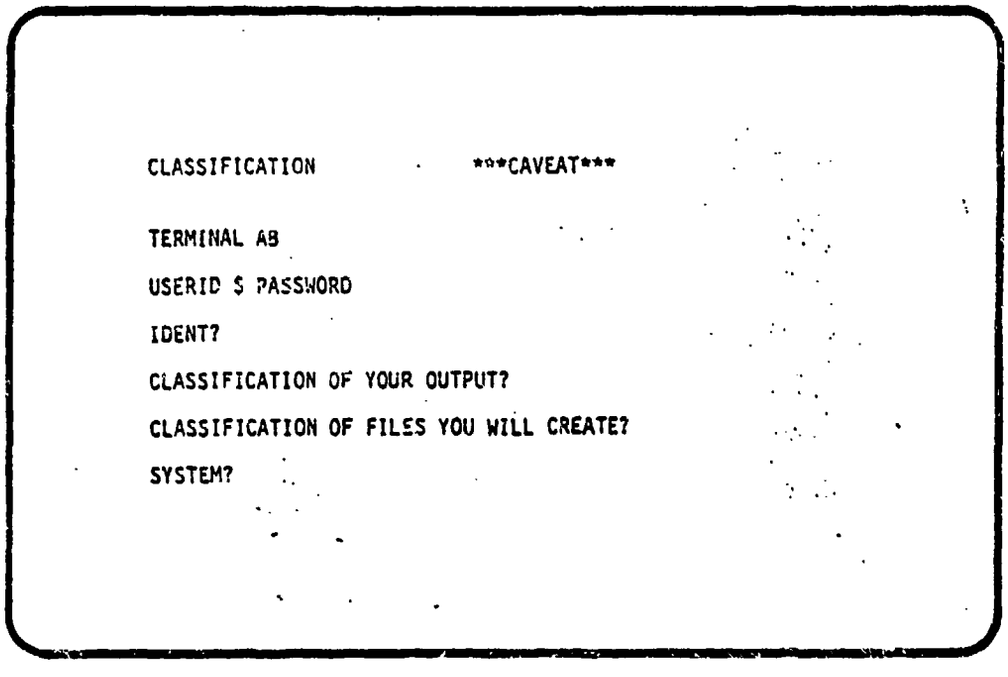


Figure D-10. Format of page 1 of the Honeywell Signon Dialogue. Redrawn from *IISS User's Manual*, p. 3-14.

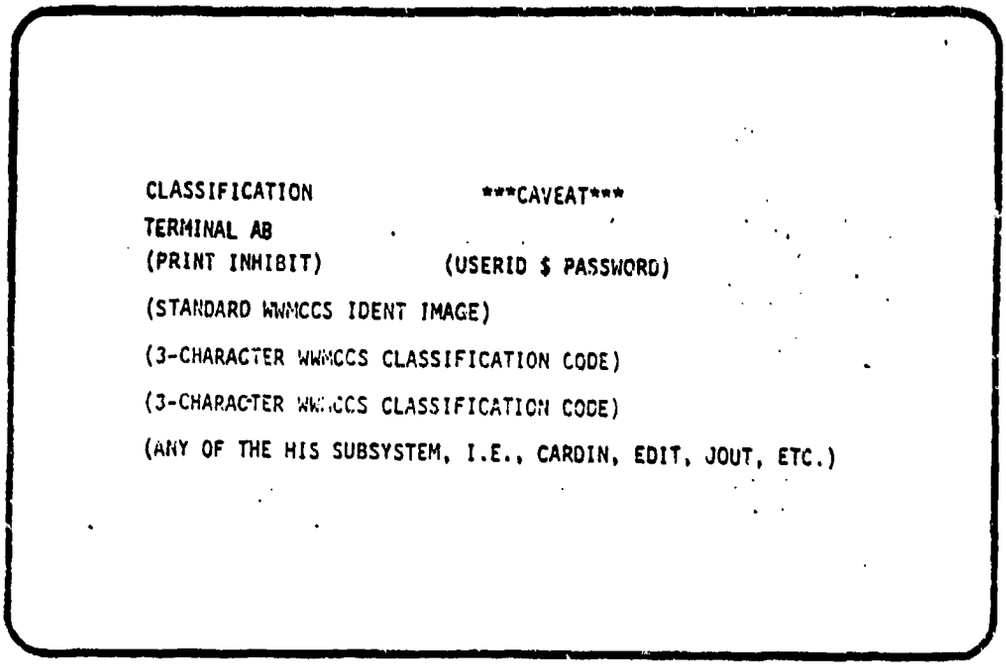


Figure D-11. Format of p. 2 of the Honeywell Signon Dialogue. Redrawn from *IISS User's Manual*, p. 3-15.

Transferring Large Amounts of Data (BDT Option)

Selecting the BDT option cuases the bulk data transfer (BDT) form (Figure D-12) to appear in SA 2. This function is used in transferring relatively large amounts of data from terminal to terminal or from disk file to disk file. The analyst/user identifies the output (recipient of data) and input (provider of data) information in the space provided. Space is provided for terminal text input to explain the reason for and content of the bulk data transfer. Specification of input and output may include one or more switch options:

1. /SI--specifies site name.
2. /FI--indicates that the preceding entry is a file specification; used to distinguish file names from user names.
3. /LB--specifies the type of label for a magnetic tape; legal values (not presented to the user) are:
   a. BL--bypass label.
   b. SL--standard label.
   c. NL--no label.
4. /AP--appends the bulk data transfer to an existing specified file.

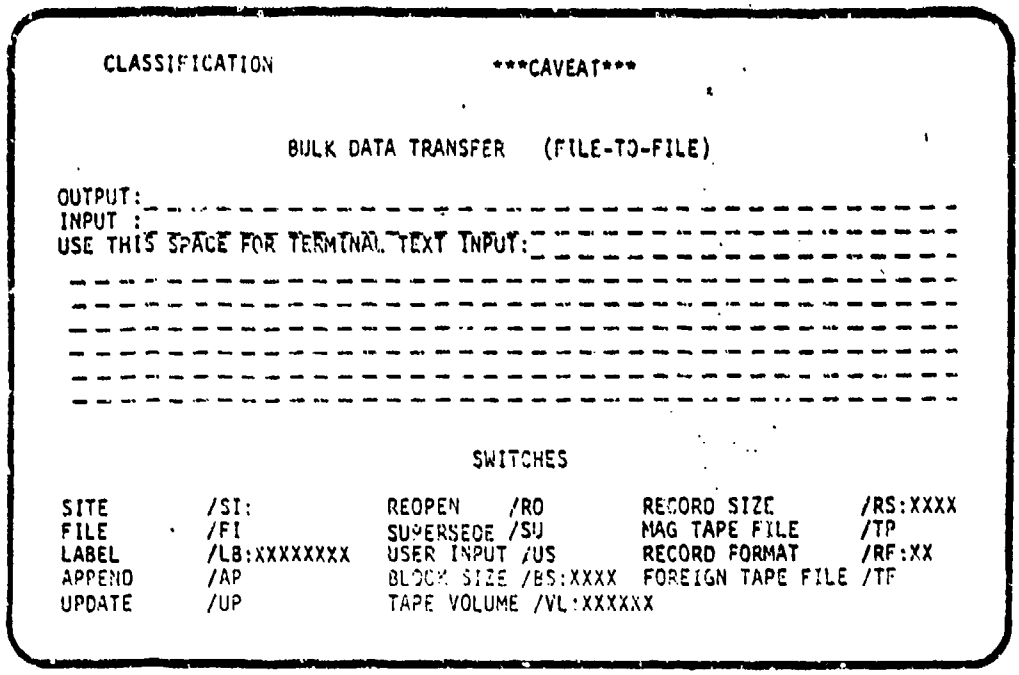


Figure D-12. Format of the Bulk Data Transfer (BDT) Preformatted Display. Redrawn from *IISS User's Manual*, p, 3-15.

5. /UP--indicates that an existing version of an output (recipient) file is to be updated.

6. /RO--indicates that a continuation file is to be re-opened.

7. /SU--indicates that an existing version of the output (recipient) file is to be superseded; the version number of the file must be explicit.

8. /US--indicates that input for the bulk data transfer will come from the user terminal; distinguishes terminal input from file input.

9. /BS:n--specifies the block size for tape or disk file; the default size (not displayed to the user) is 512 blocks.

10. /VL:n--specifies the volume label for magnetic tape.

11. /RS:n--specifies the record size.

12. /RF:zz--specifies record format for bulk data transfer output files; legal values (not displayed to user) are:

    a. VA--variable span.

    b. VB--variable blocked.

c. FL--fixed length.

d. FB--fixed block.

14. /TF--indicates that the tape file is a foreign tape file.

The analyst terminal automatically returns to the MASTER MENU when the bulk data transfer is completed.

Execute a Batch Job on the EUCOM AIDES H-6000 (RJE Option)

When the RJE option is selected, the Remote Job Entry (RJE) form (Figure D-13) appears in SA 2. Much as in the BDT situation, the user enters input and output specifications in the appropriate blanks in the form. The input required in the DATANET ID field was not specified in IISS literature. Because the RJE specification must include Job Control Language (JCL), the user must have some familiarity with Honeywell JCL to enter a remote job. IISS does not provide any information to help its users to generate JCL cards or file records.

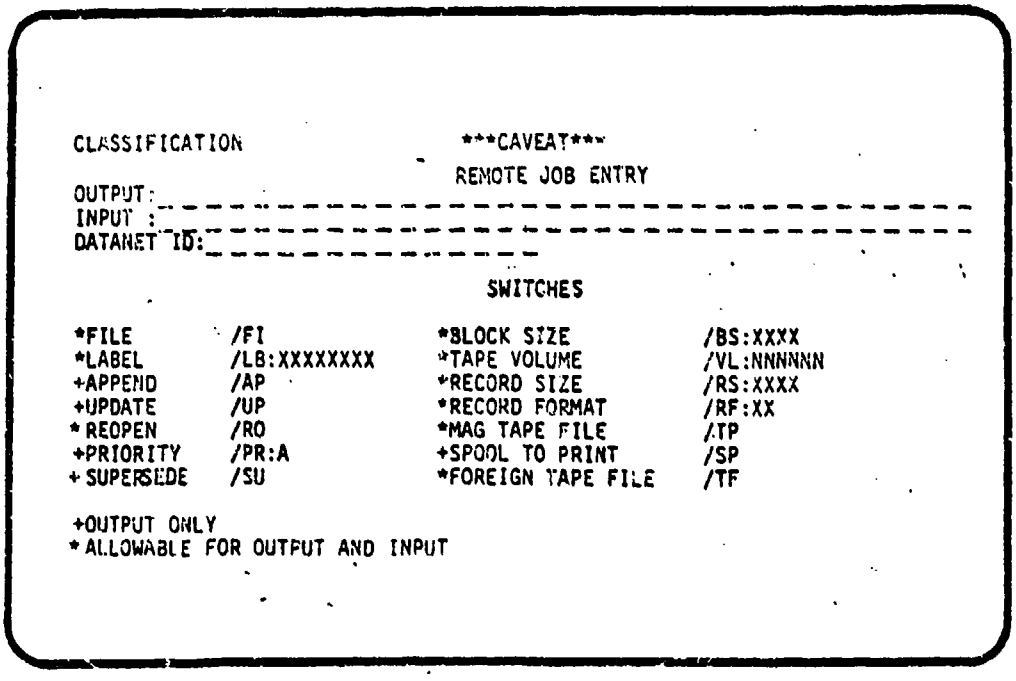


Figure D-13. Format of the Remote Job Entry (RJE) Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-17.

Completing the input and output RJE specifications requires the use of various switches. These include:

1. /FI--indicates that the preceding entry is a file name, rather than a user I.D.

2. /LB--specifies the type of label for a magnetic tape; legal values (not presented to the user) are:

   a. BL--bypass label.

   b. SL--standard label.

   c. NL--no label.

3. /AP--appends the RJE output to an existing specified file.

4. /UP--indicates that an existing version of an output (recipient) file is to be updated.

5. /RO--indicates that a continuation file is to be re-opened.

6. /SU--indicates that an existing version of the output (recipient) file is to be superseded, the version number of the file must be explicit.

7. /BS:n--specifies the block size for tape or disk files; the default size (not displayed to the user) is 512 blocks.

8. /VL:n--specifies the volume label for magnetic tape.

9. /RS:n--specifies the record size.

10. /RF:xx--specifies record format for output files; legal values (not displayed to the user) are:

    a. VA--variable span.

    b. VB--variable blocked.

    c. FL--fixed length.

    d. FB--fixed block.

11. /TP--indicates that the file is a magnetic tape file; used to distinguish tape from disk files.

12. /SP--indicates that output is to be spooled to a print file.

13. /TF--indicates a foreign tape file.

14. /PR--identifies priority of transaction.

When the user presses the SEND key, the Honeywell 6ØØØ executes the RJE task and completes the job. The MASTER MENU file is automatically displayed at the SU 1652.

Creation of JINTACCS Messages (IN ANAL Option)

Selection of the IN ANAL option results in the appearance of the Input Analyst File Selection display (Figure D-14).

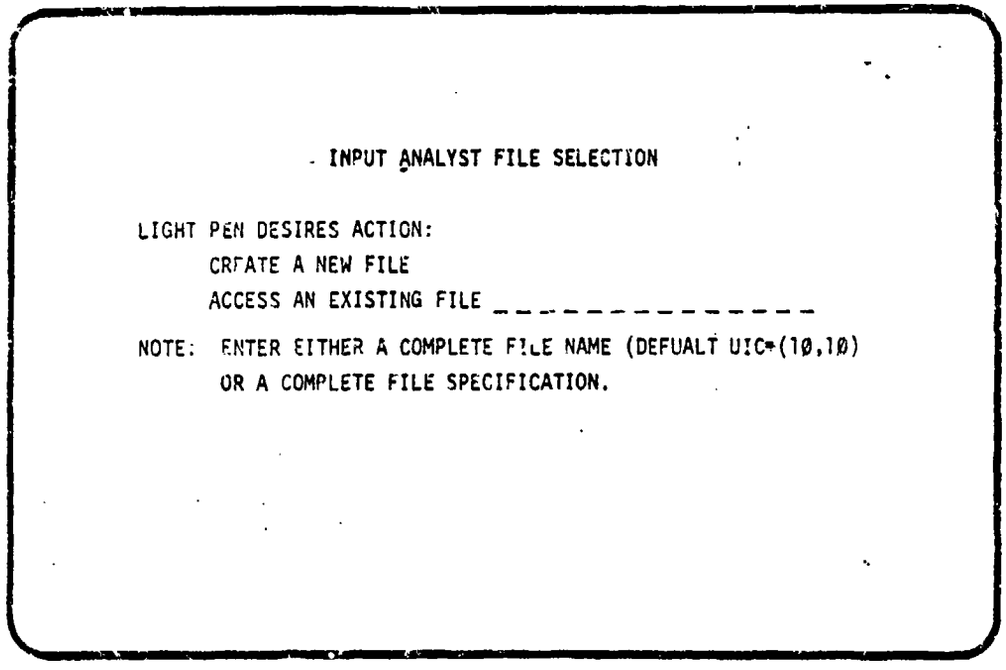


Figure D-14. Format of the Input Analyst (IN ANAL) File Selection Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-19.

The user then light pens one of the two options on the form. Selection of ACCESS AN EXISTING file indicates that a partially completed JINTACCS message already exists; the user is then required to enter a complete file name or a (if the UIC is other than (1Ø,1Ø)) complete file specification. The user then completes the JINTACCS message without the MMJ form support provided for creation of a new JINTACCS message.

Selecting the CREATE A NEW FILE option, the system displays the IN ANAL dissemination header (Figure D-15) in SA 2. The EXPLICIT ADDRESSEE(s) field must be filled in by the user. The other fields in this form are optional, being used to define further the dissemination of the completed message. The user must also light-pen one of the JINTACCS message format

designations. This results in the display of a blank JINTACCS message form (such as the one presented in Figure D-16) in SA 2. The user fills in the

```
CLASSIFICATION                    ***CAVEAT***

                          DISSEMINATION HEADER

EXPLICIT ADDRESSEE(S): - - - - - - - - - - - - - - - - - - - - - - - - - - - -
(SEPARATE WITH COMMAS) - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ACTIVITY:                                          MESSAGE TYPE: - - - - - -
  TYPE     : - - - - -
  LOCATION: - - - - - - - - -                       PRIORITY    : -
  DTG      : - - - - - - - - - -
  UNIT     : - - - - - - - - - - - - - - - - - - - RETENTION   : - - -

                    AVAILABLE JINTACCS MESSAGE FORMATS
          RII          JRSRR          TACREP          TGTINFOREP
          RRII         INTREP         SENREP          MIJIFEEDER
          DISUM        INTSUM         TARBUL          JTACARSREQ
          JRSRR        MISREP         TACELINT        HOTPHOTOREP
          JNP128       MISREP
```

Figure D-15. Format of the Input Analyst (IN ANAL) Dissemination Header Preformatted Header Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-20.

```
CLASSIFICATION                          ***CAVEAT***
                              (FIN ACCS REPORT NAME)

SECURITY CLASSIFICATION
RELEASE/--
FLAGWORD/----------------------------------
SIC/---/-----/---/---/---
AUTOPRO/----/---------/-----/-/-/--/----/---
EXER/--------------------------------------------
OPER/--------------------------------------------
MSGID/-----/-------------/-----
PERIOD/ENDING:-------
SEGMENT/GENERAL-ENEMY-SITUATION
AMPN/-------------------------------------------------------------------
-------------------------------------------------------------------------
-------------------------------------------------------------------------
-------------------------------------------------------------------------
```

Figure D-16. Format of the Input Analyst (IN ANAL) JINTACCS Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-20.

format to complete the JINTACCS message. It should be noted that the IISS system contains no information about the legal values or formats permissible for any of the fields in the JINTACCS dissemination header (Figure D-15) or the JINTACCS formats themselves (example in Figure D-16). For information on codes and abbreviations, the user must consult:

> *Intelligence Information Subsystem Datalog of Authorized Data Elements and Codes*, Second Revision, Data Element Index, TRW Document No. 28503-WØ81-RU-ØØ.

This document reference is not referenced at the terminal.

When the user has finished completing the JINTACCS message, the END-INPUT ANALYSIS (Figure D-17) is called up by pressing the END MSG VFK.

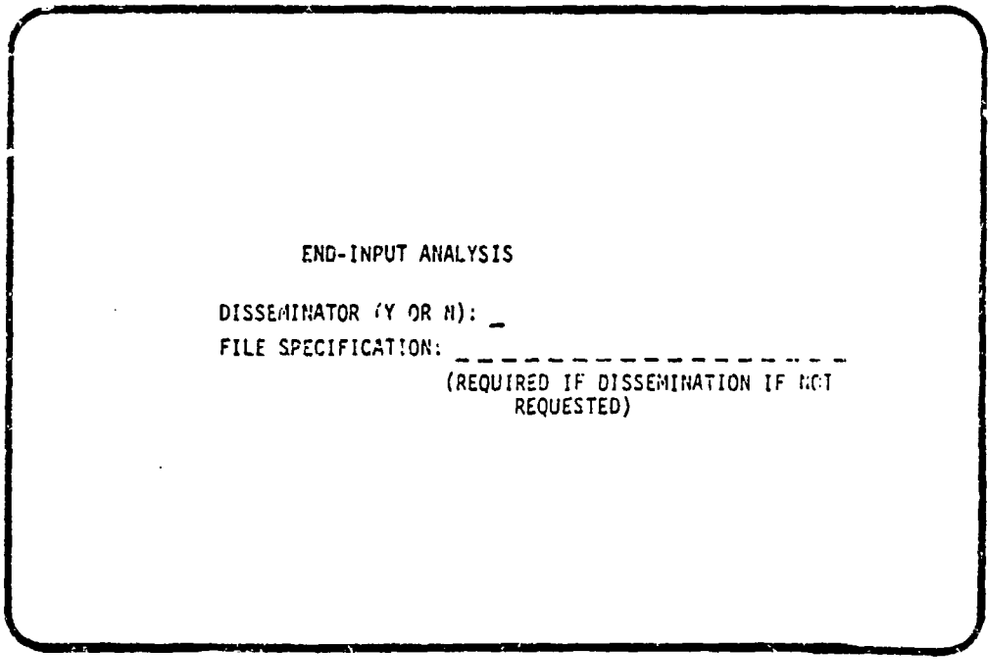


Figure D-17. Format of the Input Analyst (IN ANAL) End-Input Analysis Pre-formatted Display. Redrawn from *IISS User's Manual*, p. 3-21.

If the message has been completed, the user enters "Y" in the first field of the form. This causes the message to be disseminated to the appropriate recipients. If the user has been unable to complete the message, or if for some other reason he/she does not wish immediate dissemination, a "N" is entered in the DISSEMINATOR field. To save the message for subsequent dissemination or completion, the user must enter a file specification.

Bypass Intelligence Features of SU 1652 (TELETYPE Option)

Selecting the TELETYPE option from the MASTER MENU does not result in display of any additional menus or forms, since the TELETYPE option bypasses the MMI features normally available for IISS operations. In essence, the TELETYPE option puts the user terminal into "dual screen teletype mode," with user input accepted in SA 2, and output provided in SA 5. The TELETYPE mode provides the user with access to all IISS features available from the MASTER MENU, but requires that the user remember an interaction language. Commands for the various functions are presented in Table D-1. If the user is working with an SU 1652, the "#" at the end of each command may be deleted. (Apparently the TELETYPE mode allows terminals other than the SU 1652 to control IISS operations.)

Available IISS documentation does not indicate how the IN ANAL and PLOT options (available via the MASTER MENU) can be exercised in TELETYPE mode. Apparently the JINTACCS formats can be entered directly on an SU 1652 terminal to duplicate the IN ANAL function; it is doubtful that this function can be implemented through terminals other than the SU 1652. The status of the PLOT option in TELETYPE mode is unknown.

GIM Menu and GIM Language Options

These options result from selecting the GIM option from the IISS MASTER MENU. The basic purpose of the GIM options is to interact with the order-of-battle data bases stored in IISS under Generalized Information Management (GIM) control. They provide the capability to modify, add, to and query the data bases, as well as to generate *ad hoc* reports based on those data.

The first screen (form) which appears after selecting the GIM option is the Data Base Signon form (Figure D-18); this form appears in SA 5. The user must enter a logal IISS GIM data base in the DATA BASE NAME field; the site code (for the MIC, MRIT-S, or MRIT-L) in the SITE NAME field, and a valid password in the PASSWORD field. If these three items are entered correctly, the GIM MENU (Figure D-19) appears in SA 2.

There are five core options available from the GIM MENU:

1. GIM LANGUAGE, which permits the user to enter commands directly in GIM language.

Table D-1

Teletype Mode Command Options

OPTION	COMMAND FORMAT	COMMENT
START DEVICE	MNU>START UCn: #	UCn is the device number.
WHO	MNU>WHO #	
STOP DEVICE	MNU>STOP n #	n is the device number.
DISPLAY PRINT QUEUE DATA	1) MNU>DSPLY #	Displays a detailed summary.
	2) MNU>DSPLY Q + ALL#	Displays everything in the user-directed output queue.
	3) MNU>DSPLY ALL#	Displays a list of actual routed material.
	4) MNU>DSPLY Q + nnn SUM#	Displays a summary of queue nnn.
USER MESSAGE	MNU MSG aaa, SW/SW/SW.... <<TEXT>>	aaa = user designation SW = option switches as in MASTER MENU <<TEXT>> = body of message
HELP	MNU>HELP S (or L) #	S specifies short operand. L specifies long operand.
SIMULATE PROGRAM INTERFACE	MNU>APP #	Echoes text strings to terminal.
GIM	MNU>GIM (db name) #	(db name) is the name of the GIM data base to be employed.
MARK	MNU>HEADER nn#	nn is a numeric value corresponding to one of a set of allowable security headers.
COPY STATEMENTS	1) MNU>COPY TI: = TI:#	Copies input statements to output location when the terminal device number is unknown and designated by TI.
	2) MNU>COPY TI - aaaa.aaa#	Copies input statements from disk file aaaa.aaa to user terminal.

OPTION	COMMAND FORMAT	COMMENT
	3) MNU>COPY aaaa.aaa = TI: #	Copies input from user terminal to RSX-11D (operating system) file aaaa.aaa.
OPEN IDHSX-II	MNU>UPWIC #	
DELETE ENTRY FROM PREVIOUS USER QUEUE	MNU>SCRTCH nnn Q = aaa#	nnn is the queue entry number. aaa is the queue name.
REMOTE JOB ENTRY TO H-6000	MNU>FJE/(SW) = /(SW) #	(SW) designates switch as on RJE form obtained via MASTER MENU.
BULK DATA TRANSFER	MNU>BDT aaaa.aaa/SW/SW/...: MC =bbbb.bbb/SW#	aaa = output file designation bbbb = input file designation /SW = switch as defined in BDT form from MASTER MENU
	MNU>BDT aaaa.aaa/AP = /US #	Appends information to known file aaa.aaa = output file menu. /AP specifies "append." /US specifies that bulk data will come from user terminal.
CONNECT TO H-6000 TSS	MNU>TSS #	
SANITIZER	MNU>CBL #	

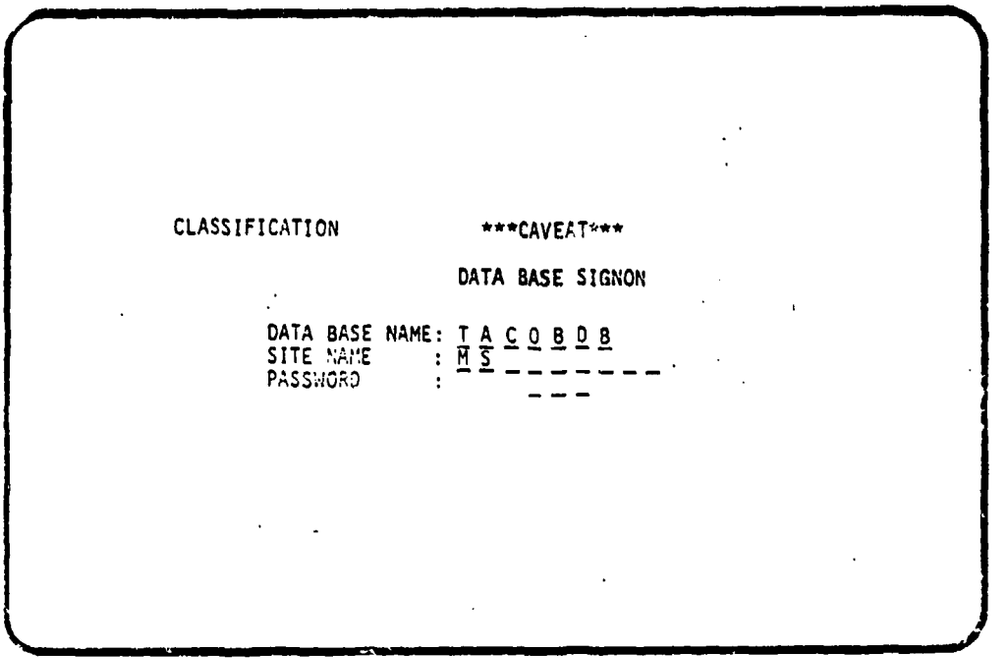


Figure D-18. Format of the GIM Data Base Signon Form. Redrawn from *IISS User's Manual*, p. 3-35.

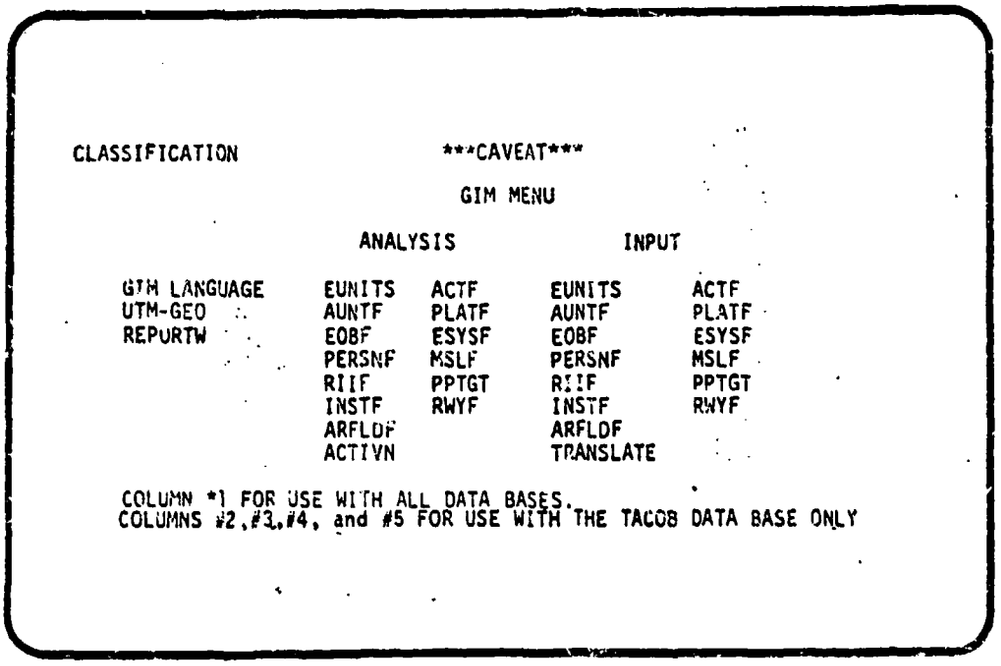


Figure D-19. The GIM MENU. Redrawn from *IISS User's Manual*, p. 3-36.

2. UTM-GEO, which supports conversion among geocoordinate systems.

3. REPORTW, which allows the user to define *ad hoc* report formats.

4. ANALYSIS, which permits the user to query the order-of-battle data bases.

5. INPUT, which permits the user to enter new records into the order-of-battle data bases.

The available IISS documentation does not specify how these options are selected; it is assumed that the light pen is used. Detailed discussions of each option are presented below.

Enter Commands Directly in GIM Language (GIM LANGUAGE Option)

Light-penning the GIM LANGUAGE option from the GIM MENU permits the user/analyst to access GIM data files directly. While the GIM LANGUAGE option is supported by forms, these are apparently not nearly so sophisticated as those associated with other GIM MENU options. Therefore, the user must be conversant with GIM language grammar and syntax. Grammatical elements of the GIM language are presented in Appendix B; a complete description of GIM language is available in three documents:

1. GIM-II Basic Users Manual (TRW-676Ø-W521-RU-ØØ).

2. GIM-II Advanced Users Manual (TRW-676Ø-W522-RU-ØØ).

3. BR-1538A (T5Ø) and BR-1538B (T8Ø) Installation and Operation TM (TM-DD-1538-2AB).

Project personnel did not have the opportunity to review these documents. GIM commands are entered in the input form displayed in SA 2; output appears in SA 5.

Geographic Coordinate Conversion (UTM-GEO Option)

Users may convert between Universal Transverse Mercator (UTM) Military Grid Reference System and geographic coordinates (latitude/longitude):

1. UTM-to-Geographic coordinate conversion. The IISS user enters the sphereoid and the UTM coordinates; geographic coordinates are calculated and displayed.

2. Geographic coordinates-to-UTM conversion. The IISS user enters the latitude and longitude; UTM coordinates and spheriod are calculated and displayed.

Both conversions are performed by filling in the appropriate sections of the display in Figure D-20.

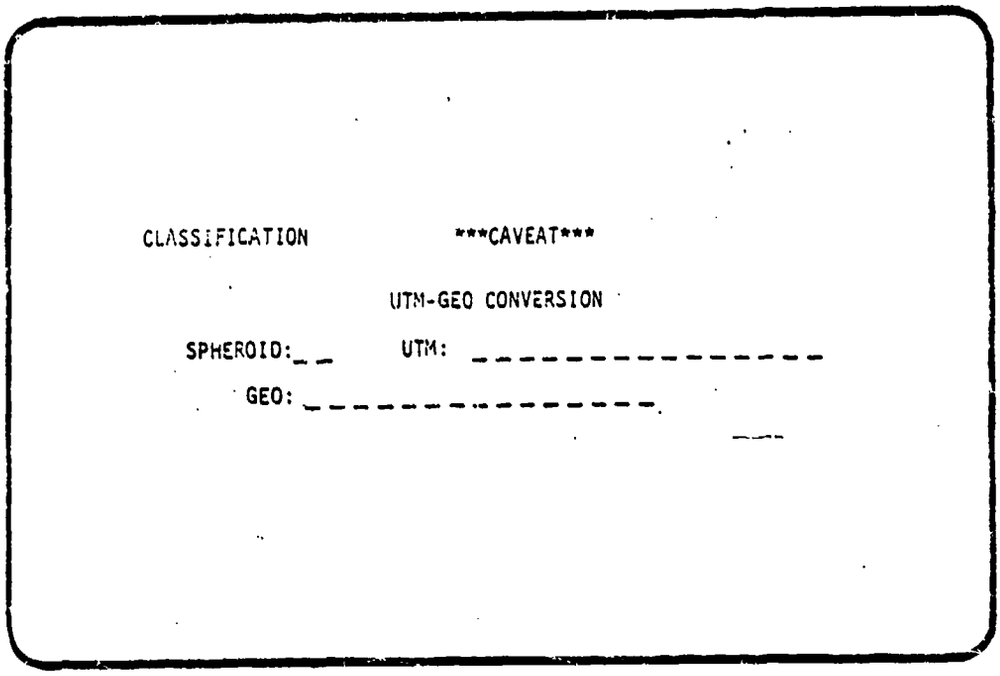


Figure D-20. Format of the UTM-GEO Conversion Form. Redrawn from *IISS User's Manual*, p. 3-37.

Report Format Specification (REPORTW Option)

IISS permits the user to define the format and content of output based on IISS file holdings. Specifications permitted include:

1. Number of lines per page (maximum of 6Ø).
2. Line width (maximum of 132 characters).
3. Heading lines (literal stings; free text input).
4. Footing lines (literal strings; free text input).
5. Column heading inclusion/suppression.
6. File to be used.
7. Data elements or variables from the file to be included.

The first five types of report specification are entered on page 1 of the REPORTW forms (Figure D-21).

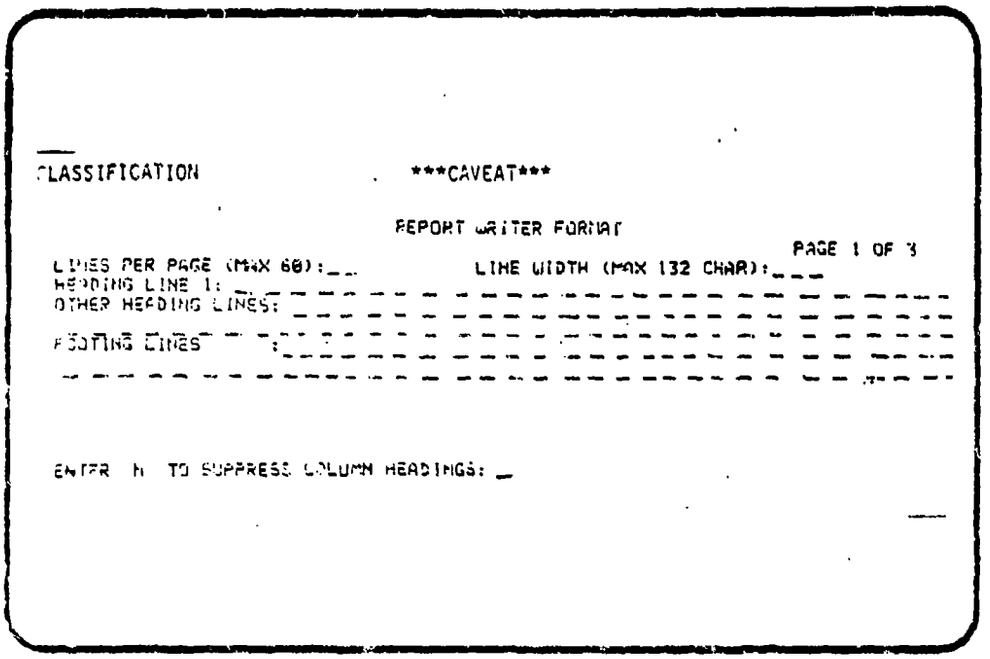


Figure D-21. First Page of the Report Writer (REPORTW) Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-39.

The User may elect to skip this page of specification and accept the GIM REPORTW format defaults. There is no on-screen indication of this default capability, nor is there any example of the appearance of the default format.

The second page of the REPORTW format (Figure D-22) cannot be defaulted, since it is used to specify the file and associated variables to be used in producing the report.

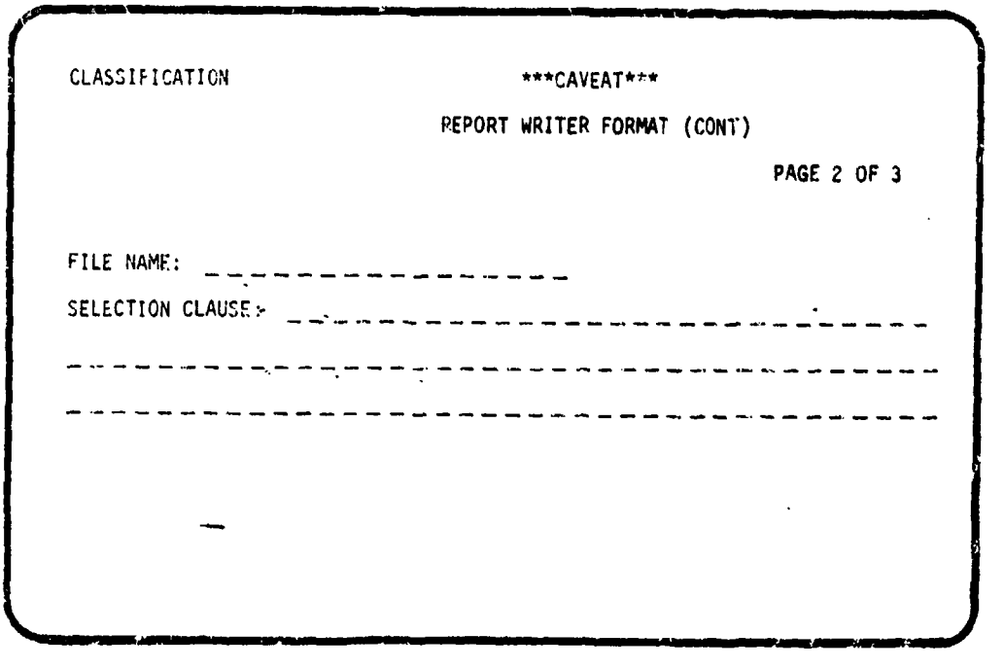


Figure D-22. Second Page of the Report Writer (REPORTW) Preformatted Display. Redrawn from *IISS User's Manual*, p. 3-39.

The user completes the FILE NAME portion of the form, and then enters the SELECTION CLAUSE. Users must enter attribute names consecutively on the form in the SELECTION CLAUSE section.

The *IISS User's Manual* mentions that the REPORTW option includes basic capabilities for "page numbering, positioning data on a print line, sorting, and summarizing a report" (p. 3-38). However, there is no explanation in the report of how to perform these functions, if they are indeed controllable by the user. Examination of the training materials developed for the IISS involvement in exercise ABLE ARCHER indicates that the following functions may be performed within the REPORTW option:

1. Attribute name specification.
2. Label specification.
3. Justification selection (right or left).
4. Sort specification (ascending or descending).
5. Sort level specification.
6. Field width.

The training materials suggest that these specifications must be entered in an appropriate format, but no prompting or help is provided to the user/operator.

Retrieval of Order-of-Battle Data (ANALYSIS Option)

To retrieve data from an order-of-battle (TACOB) data base, the analyst light-pens one of the file names listed under the ANALYSIS heading in the GIM MENU (Figure D-23). Currently, the files supported by IISS are limited to the following:

1. EUNITS (Ground order-of-battle).
2. AUNITS (Air order-of-battle).
3. ARFLDF (Airfields).
4. ACTF (Activities).
5. PERSNF (Biographicsl).
6. PPTGT (Preplanned targets).

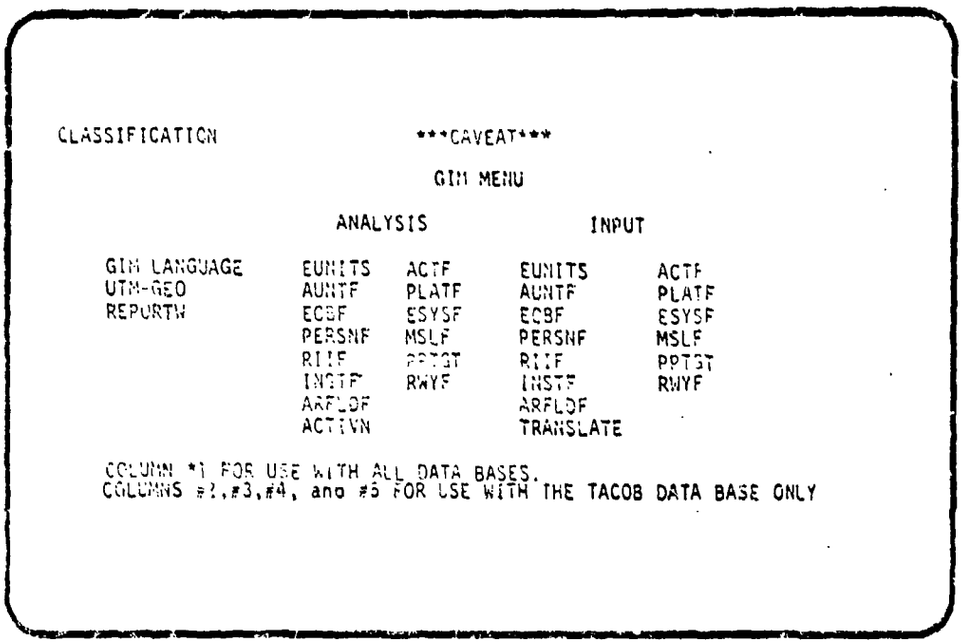


Figure D-23. The GIM MENU. (Repeated for convenience from Figure D-19.)

7. RIIF (Requests for intelligence information).

8. RWY (Runways).

9. INSTF (Installations).

A file name having been selected, the user must press either the SELECT FORM or SELECT GIM VFKs:

1. Pressing the SELECT FORM VFK causes the system to display a two-page form in SA 5. The first page of this form is a "selection/retrieval screen" (Figure 1-24). In this example (for the AUNIF, Air order-of-battle, file), the user specifies the characteristics of the unit(s) which should be analyzed. In essence, filling in this form specifies the criteria for a retrieval output listing. The user fills in the form with the desired parameters, and then displays an "index list" (Figure D-25) of those records meeting the specified criteria. The index list summarizes the information for the records meeting the retrieval criteria. In this example, the index list contains the following information:

   a. The unit I. D. Number (AUNIF).

   b. The parent I. D. number (PUNIT), which is the transliterated unit name or official identification of the unit responsible for administrative/operational control of the unit.

c. The number of equipments authorized (EQATH) in correlation with the aircraft type.

d. The actual number of aircraft (EQPOH) of a particular type on hand.

e. The function of the aircraft (ACFIF).

f. The total persons authorized (PRTOT) in the unit.

g. The foxhole total (FHTOT) for the unit.

h. CALEG, a code name not referenced or described in the "TACOB Data Base Users Guide."

The documentation reviewed does not discuss whether users can control the format or content of index list displays. Such a capability might be useful, such as in displaying the equipment type.

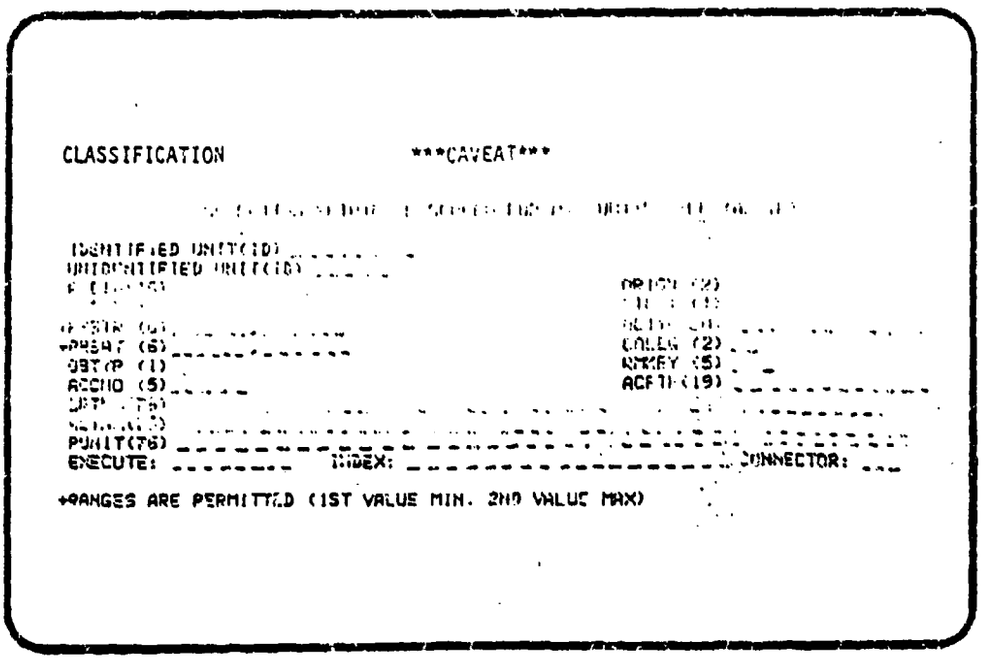
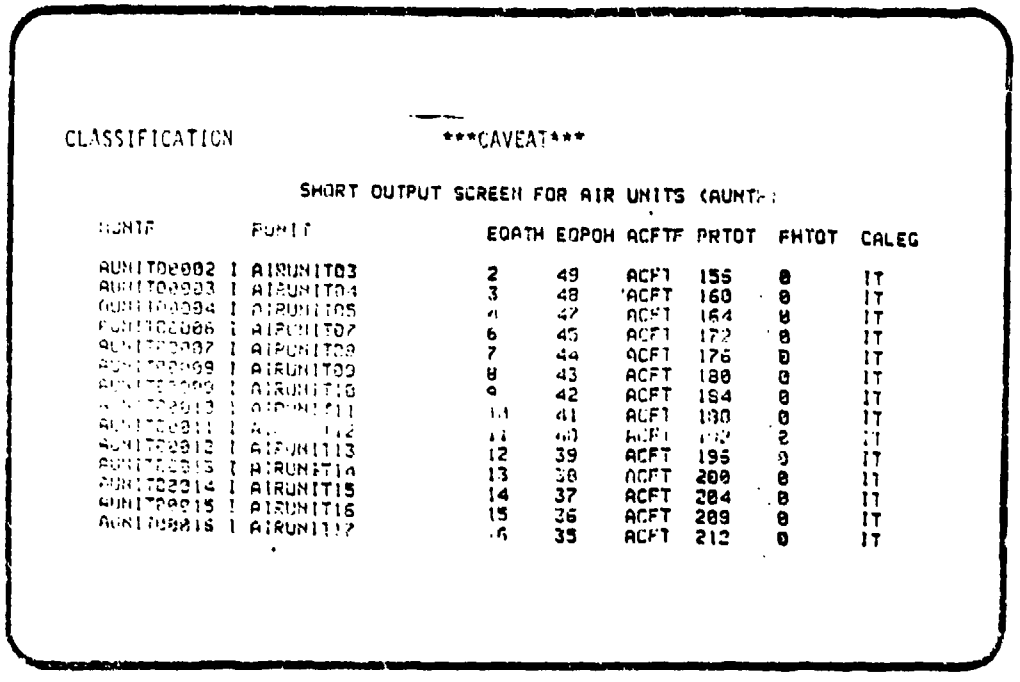


Figure D-24. Format of the SELECTION/RETRIEVAL SCREEN Preformatted Display from the ANALYSIS Function. -Redrawn from *IISS User's Manual*, p. 3-41.

After reviewing the index list, the analyst may select an individual record for more detailed scruting by light-penning a record I.D. in the INDEX LIST. When IISS is fully operational this will result in page 1 of a FULL RECORD DISPLAY (Figure D-26) appearing in SA 5. Pressing the NEXT PAGE FFK brings up the second page of the FULL RECORD DISPLAY (Figure D-27), and pressing it again results in display of the third page of the FULL RECORD DISPLAY (Figure D-28). These three pages contain all of the information about the selected record.



CLASSIFICATION ***CAVEAT***

SHORT OUTPUT SCREEN FOR AIR UNITS (AUNIT)

AUNIT	FUNIT	EOATH	EOPOH	ACFTF	PRTOT	FHTOT	CALEG
AUNIT02002	AIRUNIT03	2	49	ACFT	156	0	IT
AUNIT02003	AIRUNIT04	3	48	ACFT	160	0	IT
AUNIT02004	AIRUNIT05	4	47	ACFT	164	0	IT
AUNIT02006	AIRUNIT07	6	45	ACFT	172	0	IT
AUNIT02007	AIRUNIT08	7	44	ACFT	176	0	IT
AUNIT02009	AIRUNIT09	8	43	ACFT	180	0	IT
AUNIT02010	AIRUNIT10	9	42	ACFT	184	0	IT
AUNIT02011	AIRUNIT11	10	41	ACFT	188	0	IT
AUNIT02011	A...	11	40	ACFT	192	2	IT
AUNIT02012	AIRUNIT13	12	39	ACFT	196	0	IT
AUNIT02013	AIRUNIT14	13	38	ACFT	200	0	IT
AUNIT02014	AIRUNIT15	14	37	ACFT	204	0	IT
AUNIT02015	AIRUNIT16	15	36	ACFT	208	0	IT
AUNIT02016	AIRUNIT17	16	35	ACFT	212	0	IT

Figure D-25. Example of an INDEX LIST from the ANALYSIS Function. Redrawn from *IISS User's Manual*, p. 3-42.

As it is currently configured, the IISS does not include full record displays. According to the *IISS User's Manual*.

> *For the initial fielding of the FMS, the form FULL RECORD Displays will not be implemented. In its place will be a GIM-II list record format.* (p. 3-42.)

The "GIM-II list record format" was not provided in the documentation available to the Synectics project staff. The typical GIM-II listing is, however, linear, with the tabulation simply presenting attribute (variable) values as they occur in the GIM-II data set definition.

2. Pressing the SELECT GIM left VFK causes the system to display:

> *...a form to be completed that requires some previous knowledge of the GIM-II statement syntax. The user may construct the GIM statement on this form, up to, but not including, the LIST verb and then strike the SEND key. The system replies by presenting him with an INDEX LIST as mentioned in the Form Selection Procedure...(IISS User's Manual,* p. 3-41).

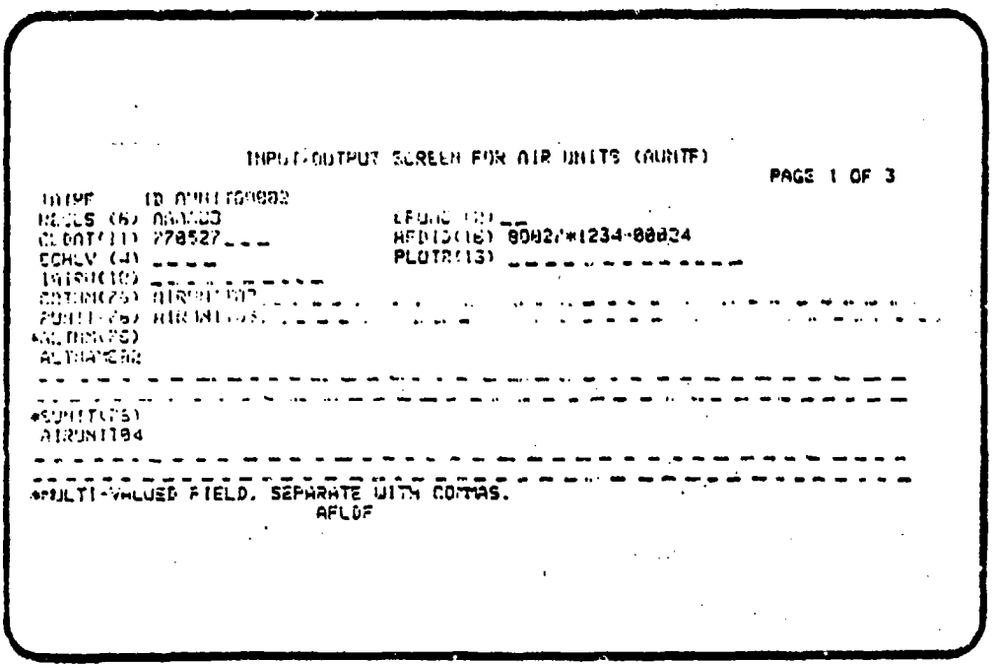


Figure D-26. Page 1 of a Full Record Display (FRD) from the ANALYSIS Function. Redrawn from *IISS User's Manual*, p. 3-43.

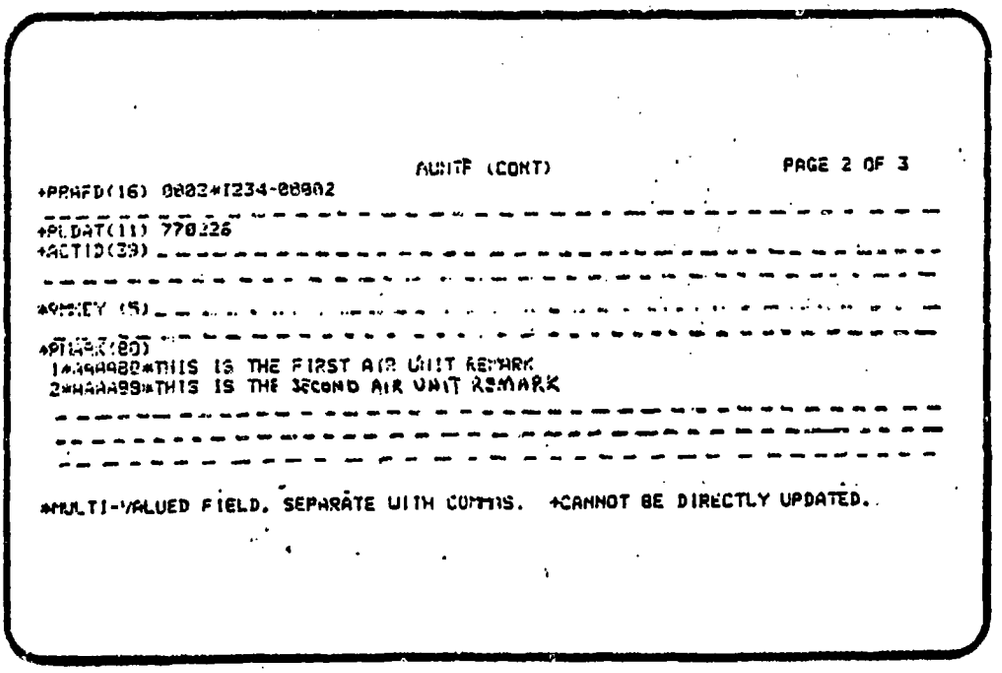


Figure D-27. Page 2 of a Full Record Display (FRD) from the ANALYSIS Function. Redrawn from *IISS User's Manual*, p. 3-43.

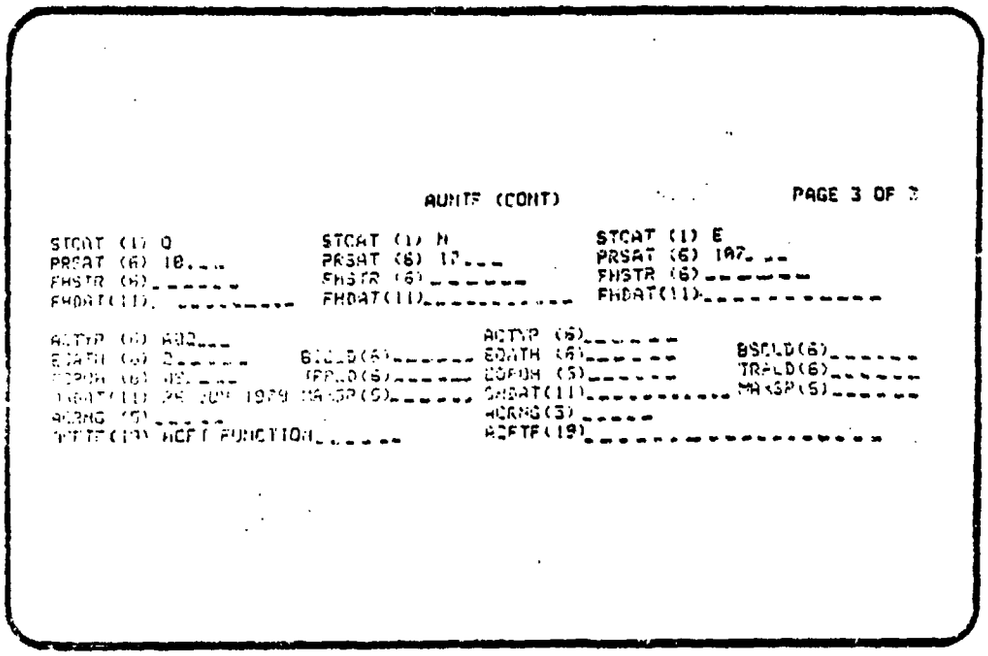


Figure D-28. Page 3 of a Full Record Display (FRD) from the ANALYSIS Function. Redrawn from *IISS User's Manual*, p. 3-43.

> The documentation available to Synectics does not indicate what the appropriate GIM formats are, nor what the format of the entry form is. After the retrieval specification has been entered, however, the data retrieval and review process proceeds in the same manner as when the Selection/Retrieval Screen was used (i.e., INDEX LIST appears, the analyst selects one of the records using the light pen, and the content of that record is displayed).

Input of Order-of-Battle Data (INPUT Option)

Input of order-of-battle data is achieved in much the same way as retrieval of order-of-battle data, except that Selection/Retrieval Screens and Index Lists are, of course, not displayed. After light-penning the desired file appearing under the INPUT heading on the GIM menu the user/analyst is presented with a blank FULL Record Display in three pages as in Figures D-26, D-27, and D-28. To add a new record to any existing file, the user fills in the appropriate blanks in the full record format and presses the SEND PFK. The user is then supposed to "check the statement appearing in SA 6 (*IISS User's Manual*, p. 3-45), although no indication of what the user is supposed to check for appears in the User's Manual.

Updating Order-of-Battle Data (ANALYSIS Option; DUPDATE Option)

In addition to retrieving individual order-of-battle records and adding new ones, the analyst using IISS may wish to change the attributes of existing records (i.e., update the existing record). At the time the available user documentation was written, there was no convenient way to update individual records. Update was accomplished using a routine known as DUPDATE. Since this was (or is) a temporary situation, the user interaction involved in using DUPDATE is not detailed here. This discussion focuses on the forms-driven update process which was planned for implementation on the IISS at the time when the user's manuals were written.

The *IISS User's Manual* is unclear about how updates are actually made. Apparently the analyst light-pens the desired file in the ANALYSIS column, light-pens the desired record from the INDEX LIST, and thus receives either the FULL RECORD DISPLAY or the GIM-II full record listing (depending on whether the SELECT GIM or SELECT FORM VFK was pressed). Whether the analyst merely "over-writes" the displayed information to make the change, or performs some other activity, is unclear from the available documentation. It should be noted, however, that updates can be performed directly using the GIM language.

Defining Geographically Oriented Searches (ANALYSIS Option)

In addition to defining retrievals on the basis of the values of record attributes, the analyst may define two types of geographically ordered search definitions: circle searches (i.e., all locations within *n* distance units from a given location) and polygon searches (i.e., all locations within a closed polygon defined by the user).

Polygon searches are specified by first proceeding as though an ordinary retrieval were being performed using the SELECT FORM option. After the Selection/Retrieval Screen appears, the analyst presses the NEXT PAGE FFK. This causes the POLYGON SEARCH form (Figure D-29) to appear in SA 5. The analyst has two options:

1. If a previously stored file of geographic points exists, the user may enter the appropriate file name in the PTCOM$ FILE ID (STORED IS NAME) field.

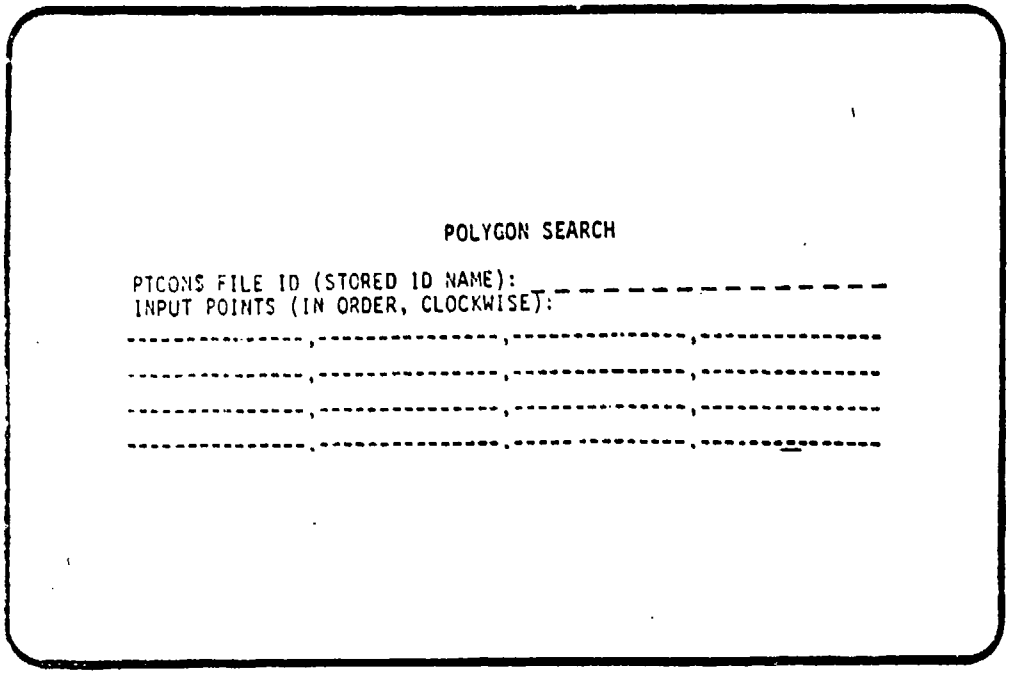


Figure D-29. Format of the Polygon Search Form is the ANALYSIS Function. Redrawn from *IISS User's Manual*, p. 3-44.

2. If a file of points does not exist, the user may enter geographic points, in order clockwise, into the appropriate place on the POLYGON SEARCH form.

The user may save the specified points for subsequent polygon-defined retrievals by entering a file name in conjunction with the specified geographic points. Up to 20 points may be entered. Existing documentation does not indicate whether the last point entered is automatically connected to the first, or the last point must be entered exactly as the first.

Inspection of the training materials prepared for participants in exercise ABLE ARCHER indicate that it is possible to define a polygon search without employing the SELECT FORM option in ANALYSIS. This method apparently employs the GIM language capability of IISS, with the polygon specification as follows:

For <<file content specification>> with $POLY (GEOLO, <<coordinate 1, coordinate 2,...., coordinate *n*" using this technique:

1. The polygon must consist of at least 3 points, and may consist of as many as 13 points.

2. Points must be entered in clockwise or counter clockwise fashion.

3. End points must connect. (NOTE: *it is assumed that this means that the start points and end points must be identical.)*

IISS also provides the users with the capability to define circle searches. This capability is apparently not available within the SELECT FORM option of analysis, but is rather employed as a feature of the GIM language. Three types of circle search definitions are possible:

1. To define a search within a circle, a command in the following format is entered:

   For <<unit specification>> with $DISTM (GEOLO, "geo-coord") LT "#meters" LIST

2. To define a search outside of a circle, a command in the following format is entered:

   For <<unit specification>> with $DISTM (GEOLO, "geo-coord") GT "#meters" LIST

3. To define a banded region around a point, a command in the following format is entered:

   For <<unit specification>> with $DISTM (GEOLO, "geo-coord") GT #2xmeters" LIST

Switches are available for three distance scales:

1. $DISTM$ = distance in meters

2. $DISTNM$ = distance in nautical miles

3. $DISTSM = distance in statute miles

APPENDIX E

DATA BASE ELEMENTS OF THE IISS

INTRODUCTION

One of the primary purposes of IISS is to permit U.S. Army Intelligence analysts to create, modify, and retrieve order-of-battle information. This kind of information describes friendly and enemy military organizational units in terms of their location, designation, authorized strength, actual strength, associated equipment (tanks, aircraft, helicopters, artillery, etc.), and other information necessary to tactical command and control. Much of the theoretical and practical utility of IISS is dependent on the structure and content of these data bases, as well as on the nature and capability of the software used to process the information held in the data bases.

ORDER-OF-BATTLE DATA BASE STRUCTURES

Three order-of-battle data base structures have been or will be associated with IISS. These are:

1. TACOB (Tactical Order-of-Battle) System, which is the primary data base structure incorporated into IISS. The TACOB structure was designed as the IISS order-of-battle information organization scheme, and was incorporated into the system when it was first fielded.

2. ASCOBS (Army Standard Ground Order-of-Battle System), a peacetime perspective, theatre-oriented ground order-of-battle structure developed with HQ USAREUR as the proponent. This data base structure was developed to perform 3 major functions:

   a. Fulfill DoD delegated production (DPD) requirements.

   b. Address European theatre ground order-of-battle (GOB) storage, maintenance, and retrieval requirements.

   c. Support production requirements of the Deputy Chief of Staff for Intelligence (DCSI).

   ASGOB is a garrison- and installation-oriented structure. It is therefore inappropriate for wartime use because military units will not be in garrison. When fully implemented, interaction with ASGOBS will be handled through a communications structure as depicted in Figure E-1. At the time of the Synectics/ARI data collection of USAREUR HQ, the on-line access to the ASGOBS data base had not yet been fully implemented. Fully operational data base access is to be attained early in 1981.

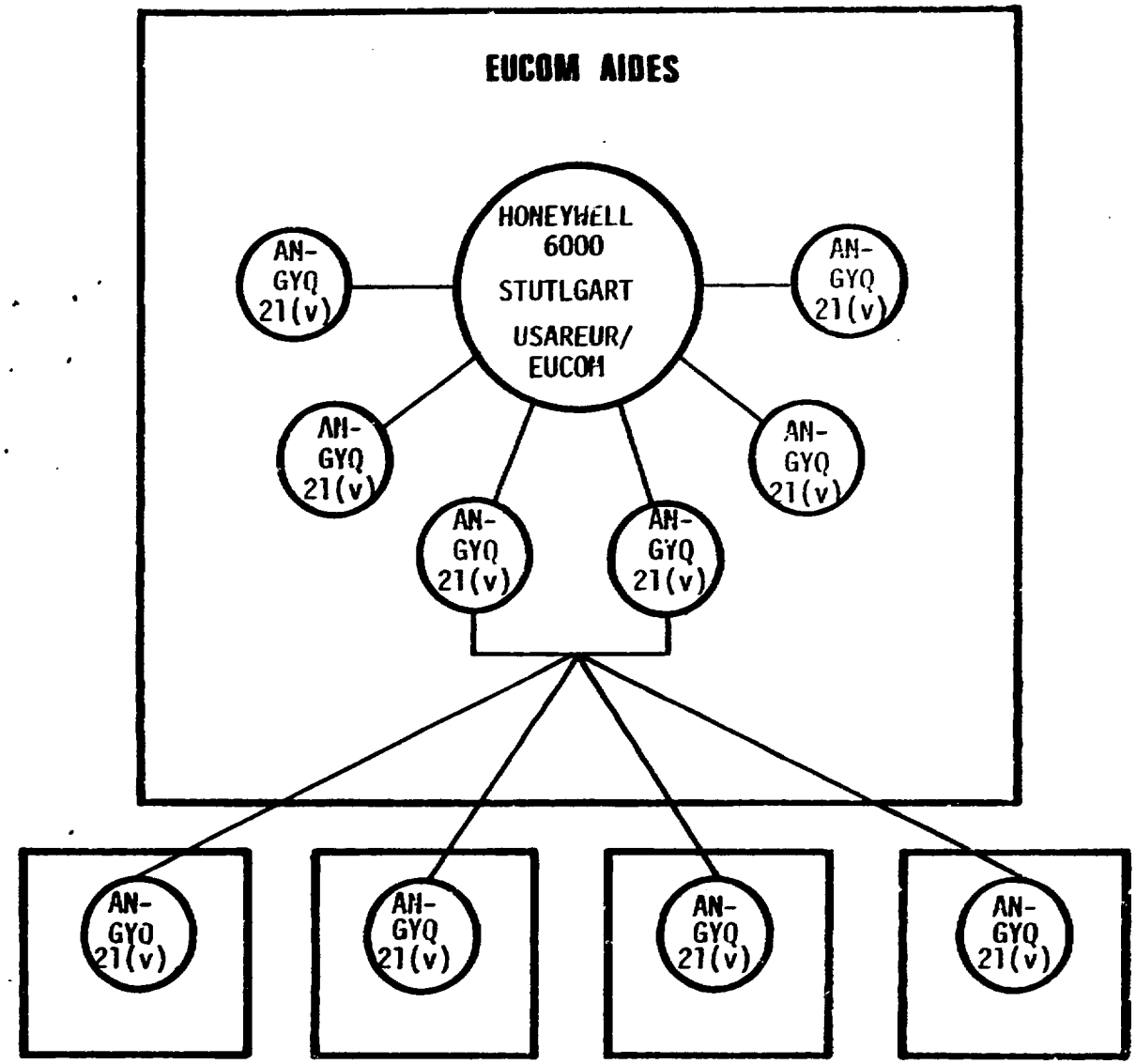


Figure E-1. Communications Structure Supporting Access to ASGOBS Data Base.

3. GOBSR (Ground Order-of-Battle Extract), which is a "one-time" data base used to enhance the realism of IISS interaction during the ABLE ARCHER exercise. This data base was formed by extracting information from an actual GOB data base, and fitting it into a tailored TACOB structure. Since this data base structure was used only once, it will not be discussed further here.

Since the TACOB data base structure is the one designed with IISS specifically in mind, and since most of the available documentation has a TACOB emphasis, the focus in this section will be on TACOB information set structure and how that structure affects IISS operations. There are, however, several important points to be made about general data base structure considerations which are not tied directly to the TACOB data base structure:

1. The TACOB data base structure is in some ways not optimum for use by U.S. Army intelligence analysts. Several examples will clarify the nature of its deficiencies:

   a. Date and time information is not handled in TACOB in the same way as in other military systems. In TACOB, only date information is stored. The date-time group (DTG) used in most military message traffic is not employed by TACOB. With the DTG structure, time accuracy (assuming valid input) is to the nearest minute; with the TACOB structure, time accuracy is only to the nearest day.

   b. Many of the TACOB files are not typically used by U.S. Army GOB analysts (e.g., air installation file; runway file).

   c. Even within the TACOB files which are used by GOB analysts, there are data items which are not employed.

2. The peacetime orientation of ASGOBS (as implemented on the EUCOM AIDES) is manifested in two ways:

   a. The focus on garrison and installation of ASGOBS is inappropriate for tactical battlefield contexts, where units will typically be in the field. In this sense, the TACOB structure (focusing on units, rather than fixed sites) is more germane to IISS operations than ASGOBS.

   b. EUCOM AIDES operation is dependent on the availability of hard wire data communication lines. Currently, some of these lines are leased from the West German Bundespost. These communication lines will be extremely vulnerable during conflicts.

Therefore, using ASGOBS implemented on EUCOM AIDES is not a viable option to the use of a true tactical analysis support system.

3. Although the ARI/Synectics data collection team did not have an opportunity to review the ASGOBS data structures, knowledgeable USAREUR personnel indicate that they are quite different from the analagous TACOB structures. GOB analysts will be using ASGOBS (via EUCOM AIDES) during peacetime; providing them with a conflicting set of structures for use during wartime is inadvisable.

4. Plans are currently being made to identify alterations to TACOB to maximize its compatibility with ASGOBS. It is unlikely, therefore, that TACOB as currently configured will survive for long in IISS.

These conditions have a definite impact on the nature of the human factors analysis which can be performed on IISS. On the one hand, it is inappropriate to spend too much time discussing the implications of a data base structure which will soon be superseded. On the other hand, it is difficult to separate some aspects of the data base structure from the IISS-human interface. In other words, knowing something about TACOB is necessary to understand the imperatives of IISS interaction. This appendix addresses, therefore, only those aspects of TACOB which are (1) necessary to understanding why the man-machine interface of IISS evolved as it did and/or (2) likely to be carried over in any GOB implementation.

TACOB DATA BASE FUNCTIONAL STRUCTURE

As originally designed, the TACOB data base consisted of five separate, but interrelated, functional information clusters. These are:

1. Ground Order-of-Battle File, which provides the battlefield commander with information on the enemy ground force.

2. Air Order-of-Battle File, containing information on identified and unidentified enemy air units, including: location; strength; home airfields; etc.

3. Biographical File, containing information on personnel associated with enemy forces and units.

4. Fire Support Management File, which supports management of fire missions on preplanned targets.

5. Activities Processing and Collection Management and Dissemination File, which supports generation requests for, and dissemination of, intelligence information.

The structure of each of these "files" is displayed in Figure E-2. Note that many of the separate information sets are accessible through (or associated with) more than one major functional area.

Interviews with IISS development personnel indicate the Army GOB analysts exposed to IISS used only the Ground Order-of-Battle and Personalities information from TACOB. While the other sets of information may be useful to USAREUR analysts as their familiarity with the system grows, past experience with IISS has naturally focused on the kinds of information which actual analysts use. Subsequent discussions of TACOB data base structure, therefore, will concentrate on the Ground Order-of-Battle and Biographical information sets. Readers of this document interested in other TACOB information sets may consult:

1. *IISS TACOB Data Base User Guide,* Document No. 28503-W100-RU-00, TRW Defense and Space Systems Group, 15 May 1979.

2. *IISS TACOB Operational Data Base,* Document No. 28503-W101,RU-00, TRW Defense and Space Systems Group, 1 May 1979.

STRUCTURE AND CONTENT OF TACOB DATA SETS AND FILES

According to the IISS system developers, the Tactical Order-of-Battle Data Base is:

> *A collection of information selectively chosen from the European Command (EUCOM) Analyst's information Display and Exploitation System (AIDES) Integrated Data Base and of information that has been loaded directly by an intelligence analyst as a result of intelligence development. The data base consists of a number of files containing information about ground units, personalities, installations, airfields, air units, and activities, and missions assigned to friendly forces to accomplish target destruction and information collection. (IISS TACOB Data Base Users Guide, p. 1)*

Structure and Content of the TACOB Ground Order-or-Battle data set. The developers of the IISS (and the TACOB base structure) indicate that:

> *The nucleus of the order-of-battle files in the Tactical Order-of-Battle data base is the set grouped under the*

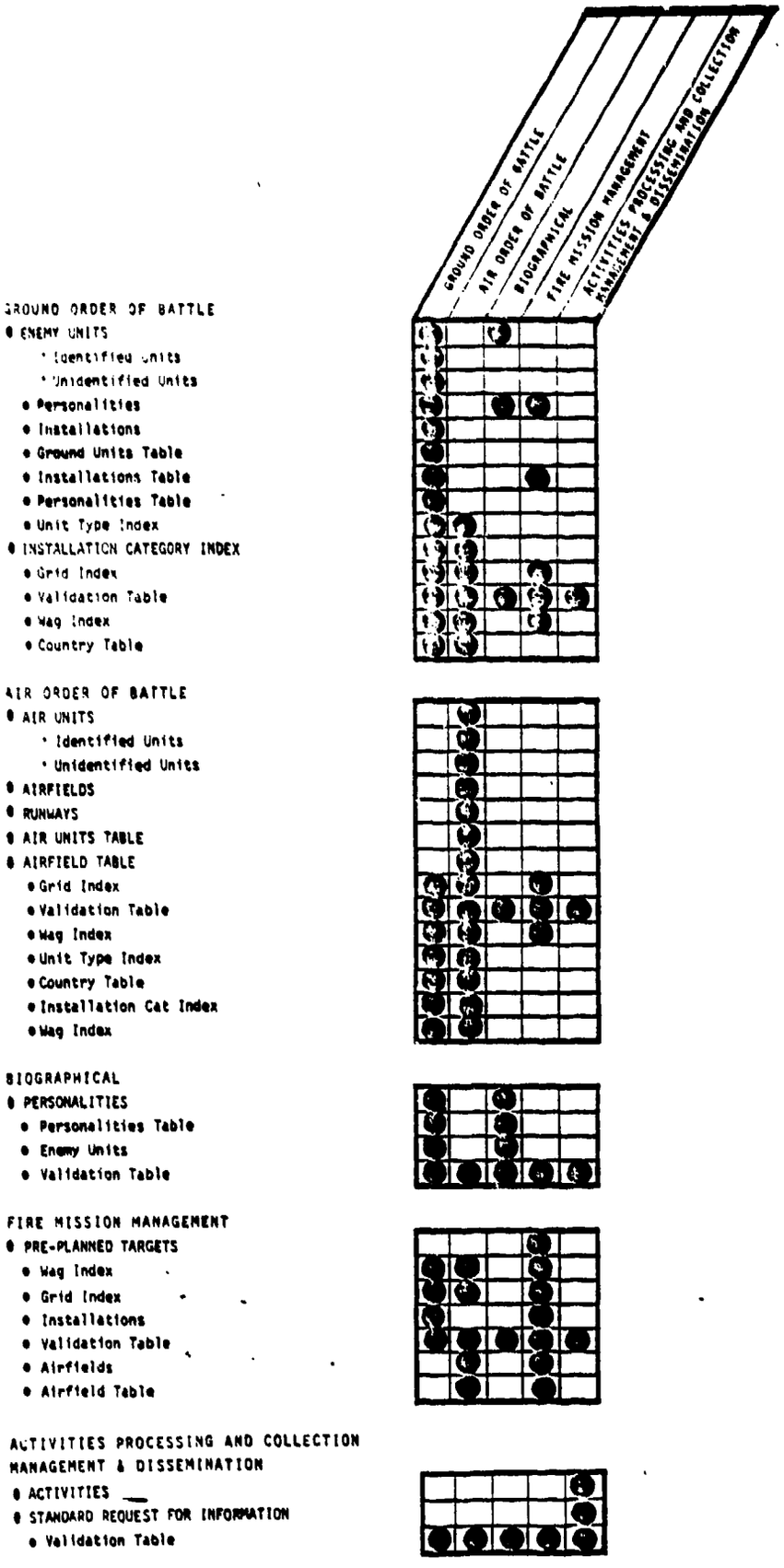


Figure E-2. Structure and Interrelationships in TACOB Functional Information Clusters.

Ground Order-of-Battle function. These files provide the commander and his staff with information about the most immediate threat to the success of a planned operation, the opposing ground force. These files will be initially loaded with information obtained from the EUCOM AIDES ASGOBS and will be maintained by the intelligence analyst as information is received and processed into acceptable facts about a particular unit, installation or personality operating or located within the area of concern to the commander. The principal files provide location, strength, and training information on identified and unidentified enemy ground units, biographic information on individuals associated with those units, and descriptive data on installations within the area of interest. Index files facilitate retrieval of this data by broad groupings such as UTM grid location, installation category, or unit type. Finally, various tables are used to validate or translate data codes from user format into storage format. (IISS TACOB Data Base User Guide, p. 13)

Principal files associated with the Ground Order-of-Battle data set are indicated in Table E-1; the file relationships within this data set are depicted in Figure E-3. The data elements contained in the various Ground Order-of-Battle files are listed in Tables E-2 and E-3. These data elements appear in the same order in which the whole record would be printed by the default GIM-II print statement. An alphabetized listing of data element mnemonics is provided in Appendix 1.

Structure and content of the TACOB Ground Order-of-Battle data set. the words of the IISS developers:

The Biographical files were established to provide information to support intelligence development concerning persons who show allegiance to a hostile force. These files will be initially loaded with information obtained from the EUCOM AIDES ASGOBS and will be maintained by the intelligence analyst as information is received and processed into acceptable facts about a particular individual. The principal files provided Country of Allegiance and location, grade, names, and/or aliases to which known, and unit of assignment information. Because many persons may be known by the same name and/or aliases a table is provided to store keys to all records of individuals who are known by a certain name. (IISS TACOB Data Base User Guide, p. 85)

Principal files associated with the BIOGRAPHICAL DATA SET are indicated in Table E-4; the file relationships within this data set are depicted in Figure E-4. The data elements contained in the Personality File of the

Table E-1

Ground Order-of-Battle Support Files. (Reproduced from *IISS TACOB Data Base Users Guide*. TRW Defense and Space Systems Group, Document No. 28503-W100-RV-00, 15 May 1979, Table 3.2.1.1, p. 14)

FILE	FILE DESCRIPTION
ENEMY UNITS	Contains information about identified and unidentified enemy ground units within a defined area of of interest. Each unit record contains information on unit identification, location, strength, training, equipment, readiness, and relationships with other units.
PERSONALITIES	Contains data about personnel associated with an enemy unit or force.
INSTALLATIONS	"A source for information concerning locations determined by the DIA ADPS center to have potential significance for intelligence development and targeting. Also assists the analyst in developing an accurate picture of the battle area." (TACOB Operational Data Base, p. 16)
GROUND UNITS TABLE	Contains all identifiers of a particular ground unit; these identifiers are cross-referenced to a standard identifier used to access records in the ENEMY UNITS file. These identifiers are also used to translate unit synonyms to the standard identifier.
INSTALLATION FILE	Contains all identifiers by which an installation is known; also contains cross references to a standard identifier.
PERSONALITIES FILE	Stores individual names along with cross references to standard biographical identifiers.
UNIT TYPE INDEX	Index permitting retrieval of unit records of a given type.
INSTALLATION CATEGORY INDEX	Index permitting retrieval of installation records of a given type.
GRID INDEX	Index permitting retrieval of records relating to a given geographic grid.
VALIDATION TABLE	Table containing legal values for Ground Order-of-Battle entries.
COUNTRY TABLE	Table containing country codes for all of the countries of the world.

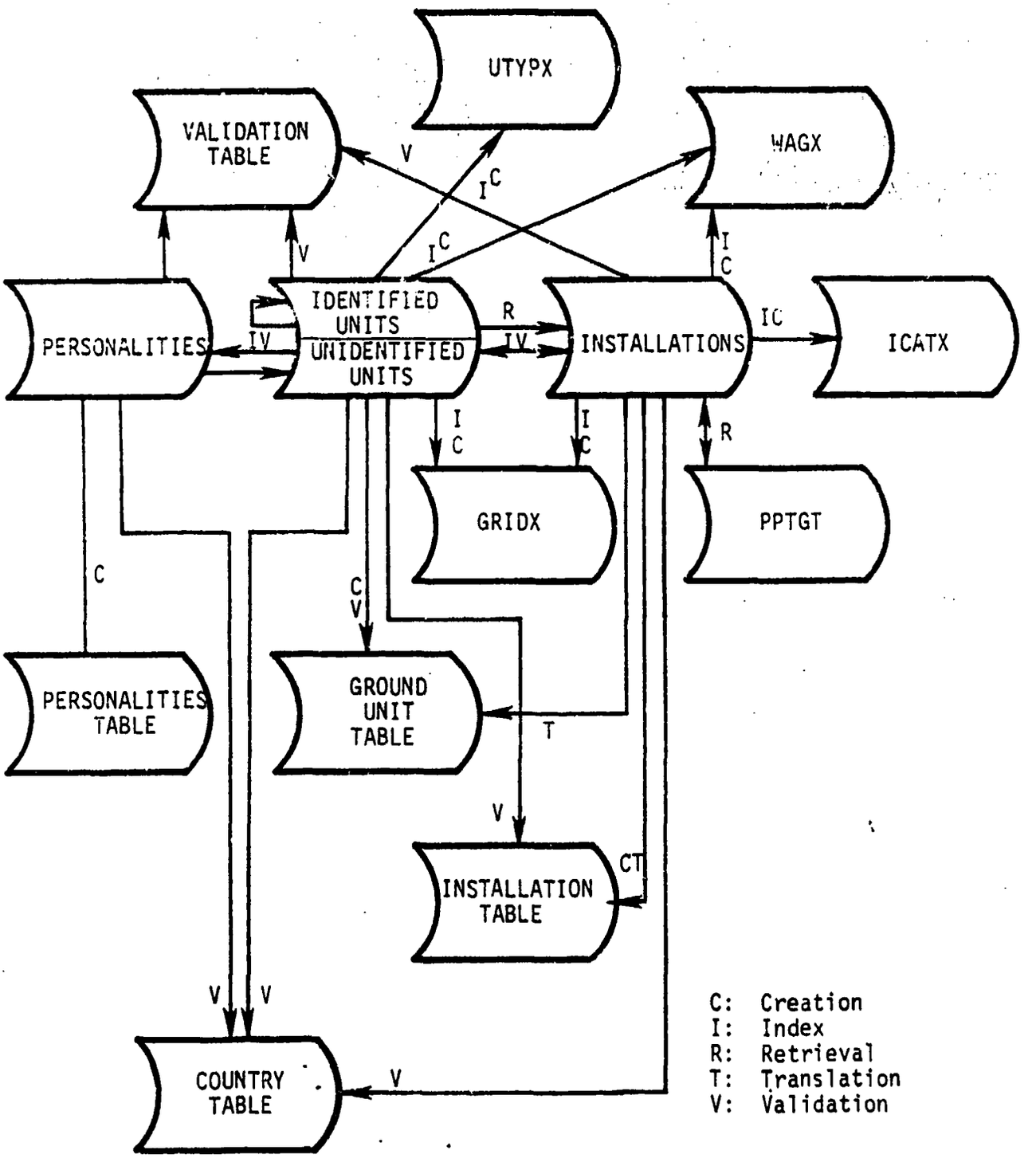


Figure E-3. Ground Order-of-Battle File Relationship for Validation, Update, Retrieval, and Translation. (Reproduced from *IISS TACOB Data Base User Guide*. TRW Defense and Space Systems Group, Document No. 28503-W100-RV-00, 15 May 1979, Figure 3.2.1, page 16).

Table E-2

Fields Contained in EUNITS GOB File

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
iUNITS ID	Identified Units I.D.		Identifier for known enemy units, consists of four-element data chain 1. Record Originator 2. Order of Battle Type 3. Country of Allegiance 4. Accession Number	
UNITS ID	Unidentified Units I.D.		Temporarily assigned identification number for enemy (or potential enemy) units which have not been positively identified. Composite of two values: 1. Analyst Identifier 2. Pin Number	
UDATE	Update		System-assigned date code; not user updateable.	Assigned upon record entry
STIME	System time		System-assigned time code; not user updateable.	Assigned upon record entry
RECLS	Security record classification group	6 characters	Used on all files; determines who will have access to the record. Consists of 5 elements: 1. Security Classification 2. Control and Release Markings 3. General Declassification Schedule 4. Exemption Category 5. General Declassification Schedule	Updated by ADD statement in GIM language.
CRTNM	Current name	Variable length	Most common or popular name of the enemy unit.	
ALTNM	Alternative name(s); nicknames	Variable length	Other names used to identify the enemy unit.	
PUNIT	Parent unit		"Parent" or controlling unit of the unit in question.	
SUNIT	Subordinate unit(s)	Multivalued field	List of all units controlled or supervised by the enemy unit.	
CMBRR	Combat Readiness Rating	1 character	Rating of the capability of the unit to fulfill assigned mission.	

Table E-2. Continued

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
RRDAT	Readiness Rating Date		Date that a readiness rating of a unit was assigned.	Update to this field not allowed unless update to CMRR done simultaneously or there is already data in CMRR.
CMNDR	Commander	10 characters	Personality code of commander of the enemy unit.	
KSMEM	Key staff member(s)	Multi-valued	Personality codes of key staff members of the enemy unit.	
POBOX	Letter box number	10 character max	Letter box number used in addressing correspondence to a unit.	
INSID	Installation identifier		Identifier for installation at which the unit is normally located.	
COLOC	Country of location	2 character max	Country of location for the enemy unit.	
GEOLO	Geographic location	nnnnnnnnnnnnnn	Latitude and longitude of the enemy unit location.	Cannot be updated without simultaneous change in CLOAT; automatic update when UTMLO is updated.
UTMLO	Universal Transverse Mercator location	nnaaannnnnnn	UTM coordinates of enemy unit location.	Cannot be updated without simultaneous change in CLOAT; automatic update when UTMLO is updated.
PUTM	Previous UTM	(same as UTM)	UTM coordinates of previous UTMLO.	Five PUTM locations can be held by system; when a new UTMLO is entered, the following sequence of activities is automatically performed: $UTMLO_{new}$ → $UTMLO_{old}$ $UTMLO_{old}$ → $PUTM_1$ $PUTM_1$ → $PUTM_2$ $PUTM_2$ → $PUTM_3$ $PUTM_3$ → $PUTM_4$ $PUTM_4$ → $PUTM_5$ $PUTM_5$ is deleted by the system.

Table E-2. Continued

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
PDAT	Previous date		Date of previous entry of location for the unit.	Five PDAT dates are associated with the five MUTH values held by the system; when a new CLDAT value is entered, the following sequence of activities is automatically performed: CLDAT (new) → CLDAT (old) CLDAT (old) → PDAT1 PDAT1 → PDAT2 PDAT2 → PDAT3 PDAT3 → PDAT4 PDAT4 → PDAT5 PDAT5 → deleted PDAT values may not be directly updated by users.
CLDAT	Change location date	6 characters (mmmmm)	Date that location of unit was updated.	CLDAT may be entered in a variety of formats: 1. January 1, 1981 2. 1 Jan 1981 3. 1 Jan 81 4. 1-2-81 5. 1/1/81 6. 1 January 1981 7. 1-Jan-81 CLDAT must be updated when UTMLO or GEOLO are changed.
TRTYP	Training type	5 characters max; multi-valued field	Specifies the type of training which an enemy unit has received.	Parent field of NODAY, TRDAT, and TRLOC.
NODAY	Number of days	3 digits max	Number of days of training of type TRTYP.	Must be entered in same update statement as TRTYP.
TRDAT	Training date	6 digits (YYMMDD)	Date of training of type TRTYP.	Must be entered in same update statement as TRTYP. May be entered in any of the date entry formats listed for CLDAT (above).
TRLOC	Training location		Location of training of type TRTYP.	Must be entered in same update statement as TRTYP.

Table E-2. Continued

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
EQTYP	Equipment type	5 characters max; multi-valued field	Type of weaponry and equipment associated with the enemy unit.	Parent field of EQATH, EQPOH, OHDAT.
EQATH	Number of equipment authorized	6 digits max	Number of equipments of type EQTYP authorized for the enemy unit.	Enter in same update statement as EQTYP.
EQPOH	Equipment on hand	6 digits max	Number of equipments of type EQTYP actually held by the enemy unit.	Enter in same update statement as EQTYP.
OHDAT	Date of equipment on hand	6 digits (YYMMDD)	Date on which equipment on hand was observed or assessed.	Enter in same update statement as EQTYP.
STCAT	Strength category	1 character; legal values are "O", "N", "E", or "C"	Strength category associated with the enemy unit.	Parent field of PRSTAT, FHSTR, FHDAT.
PRSTAT	Number of persons	6 digits max	Number of persons actually authorized or assigned to the enemy unit.	Enter in same update statement as STCAT.
FHSTR	Foxhole strength	6 digits max	Number of actual combatant personnel assigned to the enemy unit.	Enter in same update statement as STCAT.
FHDAT	Date of foxhole strength	6 characters (YYMMDD)	Date at which foxhole strength was assessed.	Enter in same update statement as STCAT. Any of input formats legal under CLDAT are legal here.
RMKEY	Remark key	5 character max	Key to remark entry (RMARK).	
RMARK	Remark	Variable length	Comment about contents of record.	
UGRID	UTM Grid location		Key to UTM grid location.	Automatically calculated by system from UTMLO or GEOLO.
CUNIT	Controlling unit		Identifier of parent unit of the enemy unit in question.	
AUNIT	Attached unit		Identifiers of units attached to the enemy unit in question.	
UTYPE	Unit organization type	2 or 4 characters	Type of mission or activity that the unit was organized to perform.	
IUNIT	Identified unit code		Used to denote the fact that an unidentified unit has been identified.	
ACTID	Associated acitivty items	37 characters in groups: 1. TITLE (20 chars) 2. MSG ORIGINATOR (7 chars) 3. MSG SERIAL NO. (10 chars)	Used to store the key fields from the ACTF file pertaining to the enemy unit.	
ECHLV	Echelon level	4 characters	Structural level, echelon, or point at which organizational control or authority of a ground unit is concentrated.	

Table E-2. Continued

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
SPHRD	Spheroid			
WAGLOX	WAGX-INDEX		World Area Grid location reference.	

Table E-3

Fields Contained in the INSTF GOB File

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
INSTF	Installation file identifier	Two part, 16 character code: 1. Functional classification (5 character) 2. "e" 3. Basic Encyclopedia code (10 characters)	Identification code for the installation.	
UDATE	Update		System-assigned code for date; not user updateable.	Assigned upon record entry/update.
STIME	System time		System-assigned time code; not user updateable.	Assigned upon record entry/update.
RECLS	Security record classification group	6 characters	Used on all files; determines who will have access to the record. Consists of 5 elements: 1. Security classification 2. Control and Release Markings 3. General Declassification Schedule 4. Exemption Category 5. General Declassification Schedule	Updated by ADD statement in GIM language.
DAREA	Military Defense Area	3 characters max	Geographic area with established boundaries under the operational control of a Military HQ.	
ARDEF	Air Defense District	3 characters max	Geographic area with established boundaries and under the operational jurisdiction of an air defense HQ.	
COLOC	Country of location	2 characters		
CCTNY	Country of control	2 characters		
CRTNM	Current name		Most common or popular name for the installation.	
ALTNM	Alternate name(s)	Multi-valued field	Alternate name or nickname associated with the installation.	
GEOLO	Geographic location	nnnnnnannnnnnna	Latitude and longitude of the enemy unit location.	Cannot be updated without simultaneous change in CLDAT; automatic update when UTMLO is updated.
UTMLO	Universal Transverse	nnaaannnnnnnn	UTM coordinates of enemy unit location.	Cannot be updated without simultaneous change in CLDAT; automatic update when GEOLO is updated.
UGRID	UTM grid location		Key to UTM grid location.	Automatically calculated by system from UTMLO or GEOLO.
POBOX	Letter box number	10 character max	Letter box number used in addressing correspondence to a unit.	

Table E-3. Continued

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
IUNIT	Identified unit			
UUNIT	Unidentified unit			
RMKEY	Remark key	5 character max	Key to remark entry (RMARK).	
RMARK	Remark	Variable length	Comment about contents of record.	
ACTID	Activity file I.D.	Multi-valued field; 3-part field: 1. Title 2. Message Originator 3. Message serial number		
SPHRD	Spheroid			
WAGLOX	WAG-INDEX		World Area Grid location reference.	

Table E-4

Biographical Data Set Support Files. (Reproduced from TRW *IISS TACOB Data Base Users Guide*, p. 86).

FILE	FILE DESCRIPTION
PERSONALITIES	Information about persons who show allegiance to a hostile force. The file provides biographic information to support intelligence development concerning individuals, units, or areas in which individuals are operating.
PERSONALITIES TABLE	Individual names are stored with all the standard identifiers associated with that name.
ENEMY UNITS	Information about both identified and unidentified enemy ground units within an area of interest. Each record contains basic identifying and location information, as well as information bearing on the unit's strength, training, equipment, combat readiness, commanders, key staff members, and associations with other units. (NOTE: THE ENEMY UNITS FILE IS PRIMARILY A GROUND ORDER OF BATTLE FILE, DESCRIBED IN PAGES ___ THROUGH ___ OF THIS DOCUMENT.)
VALIDATION TABLE	Contains values that are acceptable to the TACOB data base. (NOTE: THIS TABLE IS ACCESSED BY ALL TACOB FILES.)
COUNTRY CODES	Contains country codes for all of the countries of the world. This table verifies that an input country code value exists. The intelligence analysts may dynamically link to this table and retrieve the full name of the country. (NOTE: THIS FILE IS ACCESSED BY ALL TACOB FILES WHICH REFER TO COUNTRY CODE INFORMATION.)

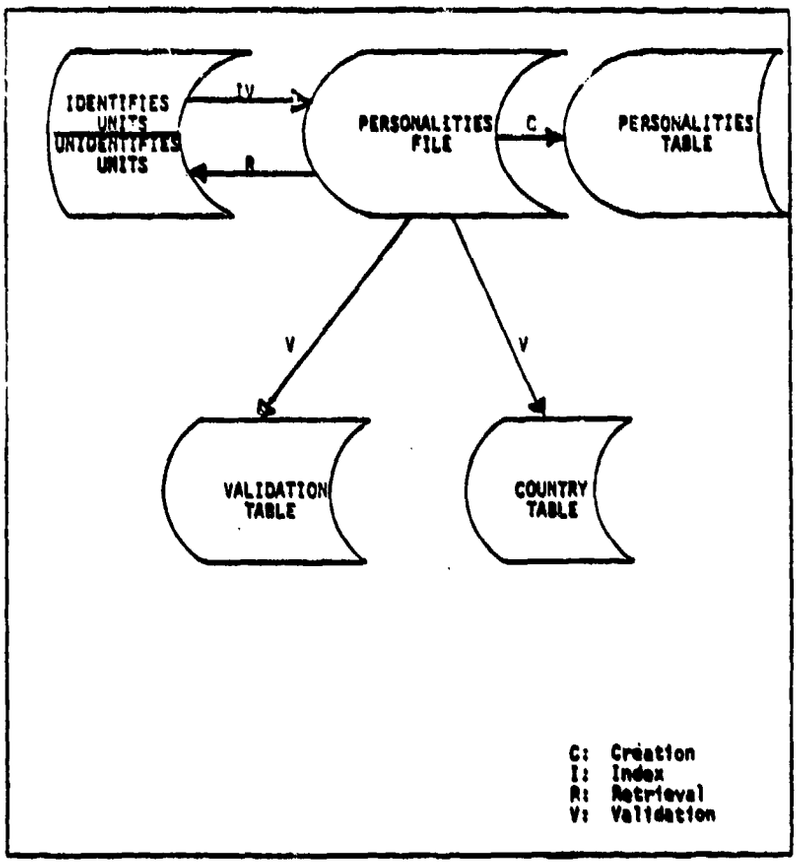


Figure E-4. Biographical Relationships for Creation, Index, Retrieval, and Validation. (Reproduced from *IISS TACOB Data Base Users Guide*. TRW Defense and Space Systems Group, Document No. 28503-W100-RV-00, 15 May 1979, Figure 3.2.3, p. 87.)

BIOGRAPHICAL DATA SET (the only file in this data set with which users interact directly) are listed in Table E-5. The data elements listed in Table E-5 appear in the same order in whcih the whole record would be printed out by the format-default GIM-II language print statement. An alphabetized listing of data element mnemonics is provided in Appendix I.

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
PERSNF ID	Personality file identifier	10 characters in 4 groups: 1. Record Orginator(2) 2. Order of Battle Type(1) 3. Country of allegiance (2 characters) 4. Access Number (5 char)	Record identifier.	
UDATE	Update		System-assigned code for date; not user updateable.	Assigned on record entry/update.
STIME	System time		System-assigned time code; not user assignable.	Assigned on record entry/update.
RECLS	Security record classification group	6 characters	Used on all files to determine who will have access to the record. Consists of 5 elements: 1. Security classification 2. Control and release markings 3. General declassification schedule 4. Exemption category 5. General declassification schedule	
PNAME	Full name of personality	Variable length record; consists of first, middle, and last name separated by asterisks. (e.g., JOHN*QUINCY*PUBLIC)	Full name of subject of biographical file record.	
FNAME	First name	Variable length	First name of personality.	
MNAME	Middle name	Variable length	Middle name of personality	
LNAME	Last name	Variable length	Last name of personality.	
ONAME	Nicknames	Variable length; multiple valued fields	Nicknames of the personality.	
ASGRD	Armed Services Grade	2 characters	Rank of foreign personality equivalent to U.S. military heirarchical grade.	
PRDOB	Personality date of birth	6 characters (YYMMDD)	Date of birth.	May be entered in any of the date entry formats valid for CLDAT (GOB EUNITS file).
NCNTY	Country of nationality	2 characters	Country where personality was born.	
CCNTY	Location country code	2 characters	Country where personality is currently located.	
TNRES	Town residence	Variable length	Last known or suspected residence of the personality	
STADD	Street address	Variable length	Street name and building identifier for the residence of the personality.	

Table E-5. Continued

DATA ELEMENT MNEMONIC	DATA ELEMENT NAME/LABEL	FORMAT	DEFINITION	COMMENTS
PFUNC	Personnel function		Description of the individuals actual function within a unit.	
RMKEY	Remark key	5 character max	Key to remark entry (RMARK).	
RMARK	Remark	Variable length	Comment about contents of record.	
IUNIT	Identified unit		Identified unit with which personality is associated.	
UUNIT	Unidentified unit		Unidentified unit with which personality is associated.	

APPENDIX F

GENERALIZED INFORMATION MANAGEMENT (GIM) LANGUAGE GRAMMAR AND SYNTAX

GIM II COMMAND LANGUAGE

VERB	DESCRIPTION
ACQUIRE	Obtains values from the data base under control of the Procedure Oriented Language routines logic.
ADD	A primary update command used to place all values and names into the GIM-II data lists and data list dictionaries.
ASSIGN	Allocates a particular GIM-II unit (physical device) as the master terminal.
BULK-UPDATE	Updates a data base with information from a file prepared outside of the GIM-II processor system.
CHANGE	A primary update command used to change any value and/or name in a GIM-II data list and/or data list dictionary. Combines the effects of the DELETE and ADD commands.
CHECKPOINT	A system maintenance verb that forces GIM-II system status information to be saved on a disk for subsequent use in a WARM start.

GIM II COMMAND LANGUAGE

VERB	DESCRIPTION
CLEAR-ALTPAGE	Causes the termination of alternate paging for the current user. Used in conjunction with the SET-ALTPAGE verb to analyze software problems during the development and maintenance of the GIM-II data base.
CLEAR-SYSTRAP	Used to terminate all SET-SYSTRAPs currently in effect. Primarily used to analyze software problems during development and maintenance.
COMMENT	Any valid GIM-II value may be entered after the comment verb.
COMPILE	Used to compile Procedure Lists in the Procedure Oriented Language.
COMPILE-DATA-BASE	A data base maintenance verb. It activates a dictionary validation and compilation of all data list dictionaries in the data base.
COMPILE-DICT	Used to validate a dictionary structure and create a compiled dictionary from a source dictionary.

GIM II COMMAND LANGUAGE

VERB	DESCRIPTION
COMPRESS-DICT	Activates the process by which the compiled dictionary area is compressed.
COPY	Takes a logical record in one data list and places it in another data list. The record copied is left unchanged.
COUNT	Determines the number of Item IDs in the target (primary) data list named in the statement.
CREATE	Used to create a HIT-FILE using either the Item ID of the primary data list or any primary/secondary attribute as the key field for the HIT-FILE.
DDUMP	Will cause the physical and/or logical disk images of the data base records or a specified portion of the data base to be written to tape or provide a statistical analysis of a specified file without a dump.
DDUMP-HDR	Will cause the header record to be read from the back-up tape.

VERB	DESCRIPTION
DEFINE-DLSYN	Used to create a synonym for a data list name and optionally places the synonym entry into a synonym dictionary.
DEFINE-SEGMENT	Defines a single segment or multisegment subset of a segmented data list.
DELETE	Used to remove any value or name in the GIM-II data list and data list dictionary.
DELETE-FILE	Removes a data list structure and all references to the data list from the data base. All space previously occupied is released.
DELETE-PROCEDURE-LIST	Removes a Procedure List and all references to the data list from the data base.
DISABLE	Disables a specified data base from processing any new input statement.

VERB	DESCRIPTION
DISPLAY	Allows the user to request summary status information and/or specific text messages from the user directed-output message queue.
DLOAD	A utility function to initialize the system files and dictionaries, and load data.
DPRINT	Causes a disk image of a data base or portions of a data base to be printed as specified.
DUMPC	Causes a disk image of the compile area of the data base or portions of the compile area to be printed as specified.
ENABLE	Reactivates a previously disabled data base so that new transactions may be processed against it.
EXECUTE	Causes the execution of a Procedure List routine that has been previously compiled via the PL-COMPILE command.

VERB	DESCRIPTION
EXTRACT	Used to produce a tape file that can be read by a user applications program for off-line report generation.
EXTRACTX	As EXTRACT with the addition that the format of the data is also sent to the terminal.
EXTRACTC	Like EXTRACT except the tape is left open and positioned at the end of the last data record entry.
EXTRACTCX	Like EXTRACTX except the tape is left open and positioned at the end of the last data record entry.
HISTORY-ANALYSIS	
INSPECT	Used to display data size and/or page size extended storage space allocations, or to obtain a list of GIM-II units and their corresponding hardware addresses.

VERB	DESCRIPTION
INVERT	Creates a cross-referenced data list.
KILL	Forces the deletion of a statement that may be causing a program looping condition.
LIST LIST-VERTICAL	The principle commands through which data are retrieved from the data base for immediate output. (LIST and LIST-VERTICAL vary only in format of the output).
LOAD-DATA-BASE	Used in conjunction with the SAVE-DATA-BASE command. It returns the previously saved data base to the active data base area.
LOCATE	Used to determine the address of the group in which a specific record is located, or, if the specific record is not part of the file already, the address of the group to which it will be assigned.
MEASURE	Used to display information about various GIM-II parameters.

GIM II COMMAND LANGUAGE

VERB	DESCRIPTION
MESSAGE	Used to transmit a message to the user that is either a textual message, a message stored in SYSER file, or a combination of both.
MODE	Used in the testing and development phase of a GIM-II application to access a specified module of the GIM-II software.
MOVE	Takes a logical record in one data list and places it in another data list; deleting the entry from the originating data list.
ORDER	Causes a data list to be sorted using the item ID as the sort key.
PRINT	Moves messages from the user's directed-output queue to the pseudo-print queue for transmission.
PRINT-BOOT	Used to obtain a listing of the bootstrap parameters contained in RRN_0.

VERB	DESCRIPTION
QSNAP	Causes statistical information about statement tasks which are active in the various GIM-II queues to be displayed.
RECREATE	Used to create an identical record in the same file with another Item ID.
RELEXT	Used to cause the current extract tape to be unloaded and the device unit on which it was mounted to be released to the GIM-II tape pool.
REMOVE	Deletes the specified operator from the system.
REPORTW	Calls a generalized report writer.
REPROCESS	For data base maintenance, the user may return all or a portion of the data base to a specified state at a given time.

VERB	DESCRIPTION
RESTORE	Causes a rewrite of an entire data base or a specified portion thereof from the tape which was created by the DDUMP command.
RESTRUCTURE-HIT-FILE	Provides a capability to alter the area assigned to a HIT-FILE.
ROUTE	Causes specified statements to be routed to the users' message queues for eventual transmission to an output device and/or a pseudo printer.
SAVE-DATA-BASE	Causes a copy of the active data base - from zero to OSTREC - to be written into a save area. Used for testing.
SCRATCH	Used to locate and delete messages from the user's directed output queue without printing them.
SET-ALTPAGE	Allows a special page of the GIM-II software to be used in place of the normal page. Used during the testing and development phase of a GIM-II application.

VERB	DESCRIPTION
SETLINE	Used to change the output line size that is usually associated with a particular output device.
SET-STATEMENT-NUMBER	Resets the system sequence number.
SET-SYSTRAP	Allows a special routine to be executed before a specified page, paragraph, or sentence is entered and/or on return from a specified page, paragraph, or sentence.
SHIFT	Performs operations between two attributes in a primary data list.
TOTAL	Used to sum the values of a field.
SIGNOFF	Issued to terminate the user's access to the data base and to the processing session.

GIM II COMMAND LANGUAGE

VERB	DESCRIPTION
SIGNON	Identifies the user to the system, receives the security keys necessary to process the user's transactions, allows selection of the user's data base, and assigns any default priorities for processing.
STARTGIM	Activates and assigns a physical device unit or devices during the user's session.
STOPGIM	Deactivates a physical device unit or devices.
STRICTIRE-FILE	Provides the foundation for a single-segment data list.
STRUCTURE-PROCEDURE-LIST	Structures and initializes a Procedure List.
STRUCTURE-SEGFILE	Structures the foundation for a segmented data list.

GIM II COMMAND LANGUAGE

VERB	DESCRIPTION
STRUCTURE-SYNDICT	Structures a dictionary which references the same data structure as an existing dictionary.
SWITCH	Used to terminate the current history tape and start a new history tape.
SYSLOAD	Provides the ability to update a data base with bulk inputs from a magnetic tape.
TERMINATE	Used to terminate the GIM-II system.
USNAP	Used to cause information about the current system users to be displayed.
ZLOAD/DLOAD	A series of modes which is capable of initializing or augmenting a data base with card input.

VERB	DESCRIPTION
$DISTNM/$DISTSM/$DISTM	Invokes a circle search routine.
$IDATE	Input date conversion of the S/EDIT expression.
$ILL1/$OLAT1/$OLONG1	Degree/minute/second latitude, longitude conversion routine.
$ODATE	An output date conversion of the O/EDIT expression.
$PF	A two argument function to address a portion of an attribute.
$PFU	A three argument function to update a portion of an existing value.

VERB	DESCRIPTION
$PIC	Allows the conversion of a computational value into an edited form suitable for printing or for storing as an alphanumeric value.
$POLY	Calls a polygon search routine.
$SCAN/$SCANX	A two argument logical function used to scan for an argument within an attribute.
$SIN	The geometric SIN function. Expressed in radian measure.
$SIND	The geometric SIN function expressed in degrees.

QUALIFIERS	DESCRIPTION
LESS/THAN (LT)	Relational operator "less than".
EQUAL/TO OR LESS/THAN (LE)	Relational operator "less than or equal to".
WITH	Specifies criteria that will be shared by an adjacent with-phrase or where-phrase.
WHERE	Specifies criteria.
WHEN	Specifies criteria.
NEAREST	In closest proximity.

QUALIFIERS	DESCRIPTION
=	Arithmetic equality.
( )	Parenthetical grouping of arithmetic operators.
EQUAL/TO (EQ)	Relational operator "equal to".
GREATER/THAN (GT)	Relational operator "greater than".
EQUAL/TO OR GREATER/THAN (GE)	Relational operator "greater than or equal to".
NOT EQUAL/TO (NE)	Relational operator "not equal".

QUALIFIERS	DESCRIPTION
/DICT	When appended to any data list name may be considered as a processing qualifier. Restricts the action of the verb to the dictionary for the data list as opposed to the data list where the values are stored.
LINK, FOR	Address qualifiers. Once a data list is properly addressed, or limited, by these qualifiers, all other data lists on the data base are excluded from consideration.
+	Addition.
-	Arithmetic subtraction.
*	Arithmetic multiplication.
/	Arithmetic division.

QUALIFIERS	DESCRIPTION
FIRST	Initial element or item.
LAST	Last element or item.
NULL	None, test fields having no entries or elements.
GREATEST	Greatest.
SMALLEST	Smallest.
ABSOLUTE	The absolute value or positive value of any numeric data regardless of the arithmetic sign on that data.

QUALIFIERS	DESCRIPTION
EVERY	Cause the attribute or expression being modified to be evaluated across all of the other attribute's values.
NEW	
ONLY	
JUST	

SYSTEM LITERALS	DESCRIPTION
$DATE	A six character string with date in MMDDYY format.
$DATE1	System date in YYMMDD format.
$DATEG	GIM-II format date in integer number.
$DATEDD	Day.
$DATEMM	Month.
$DATEYY	Year.

SYSTEM LITERALS	DESCRIPTION
$ONE	Post numeric 1.
$UNAME1	Organization name of user "signed-on".
$UNAME2	Name of user executing the statement.
&USEQI	Sequence number of input statement.
$USEQP	Sequence number of input statement within a procedure.
$USTIME	Transaction time logged for input statement.

SYSTEM LITERALS	DESCRIPTION
$DEVICE	User input device number.
$REJCTR	Tally containing an error message number.
$TYMON	Start time of session in hours to four places.
$DBNAME	Data base name; user ISGNON statement.

CONNECTIVES	DESCRIPTION
AND	The logical connective having the following truth table: AND | T T | T T F | F F T | F F F | F
OR	The logical connective having the following truth table: OR | T T | T T F | T F T | T F F | F
NOT	The logical connective having the following truth table: A | NOT A T | F F | T
IF...THEN...ELSE	A series of connectives usable only in the context of the update edits.

SYSTEM LITERALS	DESCRIPTION
$DEVICE	User input device number.
$REJCTR	Tally containing an error message number.
$TYMON	Start time of session in hours to four places.
$DBNAME	Data base name; user ISGNON statement.

CONNECTIVES	DESCRIPTION
AND	The logical connective having the following truth table: AND T T | T T F | F F T | F F F | F
OR	The logical connective having the following truth table: OR T T | T T F | T F T | T F F | F
NOT	The logical connective having the following truth table: A | NOT A T | F F | T
IF...THEN...ELSE	A series of connectives usable only in the context of the update edits.

APPENDIX G

SWITCHES USED IN IISS MMI FORMS

SWITCH CODE AND FORMAT	DESCRIPTION OF SWITCH FUNCTION	FORM IN WHICH SWITCH USED			
		START DEVICE	USER MESSAGE	BDT	RJE
/AL	Routes a user message to all users logged on at a specific site.		●		
/AP	Output to be appended to an existing file.	●		●	●
/BS:n	Specifies block size for tape or disk file.			●	●
/DE	Input file to be deleted at close.	●			
/FC	File has FORTRAN carriage control.				
/FI	File specification indication.			●	●
/HI	Data transmission through high-speed line.				
/LB:xx	Label type for magnetic tape.			●	●
/LO	Specifies list only device.	●			
/MT	Specifies user terminal.	●	●		
/NL	Soft device is not to be logged on.	●			
/OP	Operator is to receive message.		●		
/PR:a	Priority indicator.		●		●
/PR	Preamble for soft device.				
/RE	Retain message for user not logged on.		●		
/RF:ne	Record format for blocked files.			●	●
/RO	Specifies re-opening of continuation files.			●	●
/RS:n	Specifies record size.			●	●
/SI:xx	Specifies site name.		●	●	
/SP	Output to be spooled to directed output.	●	●		●
/SU	Existing file version to be superseded.	●		●	●
/SZ:n	Override line size for file.	●			
/TF	Foreign tape file.			●	●
/TP	Magnetic tape file.	●			
/UP	Update existing version of file.	●		●	●
/US	Input will come from the user terminal.	●		●	
/VL:n	Volume label for magnetic tape.			●	●

APPENDIX H

RECORD ELEMENT CODES USED IN IISS

MNEMONIC	ABBREVIATION
ACCNO	ACES-NO
	ACES-NO
ACCUR	EVA-ACCUR
ACFTF	ACFT-FCTN
ACKIN	ACK-IND
ACMSG	MSG
	MSG
	MSG
ACRNG	ACFT-RNG
ACTF	ACT-IDENT
ACTID	ACT-IDENT-FLD
ACTIVRT	GEO-COORD-SEC
	GEO-COORD-SEC
ACTXT	ACT-TEXT
ACTYP	ACFT-TYPE
ADATE	DATE-PERS-PRES
AEOBF	EOB-FIDA
	EOB-FIDA
AFDID	AFLD-ID
AFDIDPT	GEO-COORD-SEC
	GEO-COORD-SEC
AFTBL	AFLD-ID
ALIGH	RWY-HDG
ALIGS	RWY-ALIGN
ALTNM	UNIT-ALT-NAME
AMSLS	ASSOC-MSL-TYPE
ANALC	ANAL-IDENT
	ANAL-IDENT
ANGSC	SEC-ANG
APLAT	ASSOC-PLATF-TYPE
APRTY	PRY
	PRY
ARDEF	AD-DIST
ARDTG	DTG-ARMY
ARFLD	NAM-ARFLD
ARFLDF	AFLD-ID
ARFLDT	AFLDF-ID
ASCAP	RWY-CAP
ASCAS	RWY-CAPACTY-STAT
ASGRD	GRD-ARMD-SVC
ATIME	T-ORIG-UPD
ATYPE	ACT-TYPE
AUNIT	ATT-UNITS
AUNTF	EUNIT-AIR
AUTBL	EUNIT-AIR
AWPNS	ASSOC-WPN-SYS
BDMGA	BAT-DMG-ASSESS-FLAG
BEAMW	BM-WD
BENUM	BSC-ENCL-NO
	BSC-ENCL-NO
	BSC-ENCL-NO
	BSC-ENCL-NO

MNEMONIC	ABBREVIATION
BLOCK	MSG-BLK-COUNT
BSOLD	BASE-LD
CALEG	CNTRY-CODE
CATCD	FUNCTCLASS
	FUNCTCLASS
CONTY	CNTRY-CODE
CDIGR	COLL-TRIG
CLDAT	CUR-LOC-DTD
CMBRR	RDNS-RTG
CMNDR	CMNDR-NAME
CMSNO	COL-MSN-NO
	COL-MSN-NO
CNTRY	CNTRY-WORLD
COLOC	CNTRY-CODE
CPNAM	COLL-PROJ-NAME
CRDAT	DATE
CRMKG	CONT-RLSE-MK
	CONT-RLSE-MK
CRTNM	CURR-UNIT-NAME
CSDAT	DATE
CTRIG	COL-TRIG
CUNIT	CONT-UNIT
CYCIR	CY-ILLUM-RT
DAREA	MIL-DEF-AREA-TMP-LOC
	MIL-DEF-AREA-TMP-LOC
DATE	DATE
DECAT	DECLAS-CAT
	DECLAS-CAT
DGDCM	DWNGRADE
DOCCL	DOC-CLASS
DRCRM	DOC-CONT-RLSE-MK
	DOC-CONT-RLSE-MK
DRDGN	DOC-CLASS
DRDTG	DRAFTDT
DRGDS	GDS
	GDS
DRG	DTG-DEST
DSDTG	DDTG-DEST
DSPTY	DEST-PRY
DUNIT	DESIG-UNIT
EAIID	EUC-AID-ID
EANAL	EXPLI-ANAL-FCTN/NAME
	EXPLI-ANAL-FCTN/NAME
EBSEQ	EOB-SEQ-NR
	EOB-SEQ-NR
ECHLV	GD-UNITECHL
EFTBL	EPL-FMT-TBL-ID
EFUNC	EQPT-FCNT
ELORI	ELP-ORIENT
ENODE	EXP-NODE
	EXP-NODE
	EXP-NODE

MNEMONIC	ABBREVIATION
EOBF	EOB-FID
	EOB-FID
EOBID	EOB-ID
	EOB-ID
EOTGT	TGT-DMG-ASSESS
EPLTBL	EPL-TBL-ID
EQATH	EQPT-ENT-AUTH
EQPOH	EQPT-ENT-ON-HAND
EQTYPE	EQUIP-CD
ERESP	EXP-ADRS-RESP-CODE
	EXP-ADRS-RESP-CODE
	EXP-ADRS-RESP-CODE
ESCAN	ELEC-SCNR-P
ESYSF	ELINT-SYSF-ID
ETFLG	EXPL-PRCS-FLAG
	EXPL-PRCS-FLAG
	EXPL-PRCS-FLAG
EUNITS	EUNIT
EUSER	EQPT-USER
EXADR	EXPLI-ADRS
EXCAT	XGDS-CAT
	XGDS-CAT
EXRNM	EXER-NAME
FHDAT	FX-STR-DATE
FHSTR	FOXH-STR-TOT
FHTOT	FOXH-STR-TOT
FLAGS	STAT-FLAGS
FLGWD	FLAGWORD
FMODE	XMSN-FMT-MOD
FNAME	PERSNF
	PERSNF
FRINT	FRG-RT-INT
FUDEF	FUNC-DEF
GDSCH	GDS
	GDS
GEOLO	GEO-COORD-SEC
GLOCN	GEO-COORD-SEC
GNIOX	GEO-COORD-CONV
	GEO-COORD-CONV
GRADE	RWY-GRADE
GRIDX	GRID-1K-LOC
	GRID-1K-LOC
GUIDE	MSL-GUID-SYS
GUTBL	EUNIT-GRD
HEAD	RWY-HDG
HGEL	GEO-COORD-SEC
	GEO-COORD-SEC
HGEOL	GEO-COORD-SEC
HLORI	HIST-ELP-ORIENT
HPRFR	H-PRF
HSDTG	DTG-HIST
HSMAA	HIST-SEMI-MAJ-AXIS

MNEMONIC	ABBREVIATION
HSMIA	HIST-SEMI-MIN-AXIS
	HIST-UTM
	HIST-UTM
IAIRF	AR-UNT-ID
IAIRU	AR-UNT-ID
ICATD	INST-CST-INDX
	INST-CAT-INDX
ICATX	INST-CAT-INDX
	INST-CAT-INDX
IEOBF	EOB-FIDI
	EOB-FIDI
INCAT	INST-CAT-INDX
	INST-CAT-INDX
INDAT	DATE
INNUM	INSTG-IDENT-SERNO
	INSTG-IDENT-SERNO
	INSTG-IDENT-SERNO
INSID	INST-ID
INSIDPT	GEO-COORD-SEC
INSTF	INSTF-ID
IUNIT	ENEMY-GROUND-UNIT
IUNITPT	GEO-COORD-SEC
	GEO-COORD-SEC
IUNITS	EU-UNT-ID
JETBR	RWY-JET-BAR
JLDAY	DA-OF-YR
KSMEM	KEY-STF-MEM-NAM
LAHME	LAT-HEMSPHR
LATIC	LAT-SEC-ANG
LATTD	LAT-DEG
LATTM	LAT-MIN-ANG
LCNTY	CNTRY-CODE
LNAME	LST-NM-PRSN
LNGTH	RWY-LNGTH
LNGTS	RWY-LNGTH-STAT
LOCAT	LOCATION
LOHEM	LONGE-HEMSPHR
LONGD	LONGE-DEG
LONGM	LONGE-MIN-ANG
LONGS	LONG-SEC-ANG
LPRFR	L-PRF
LTIOV	MSG-ORIG
MIDEF	MOD-TYPE-DEF
M1DEL	MOD-TYP-DEF
M2DEF	MOD-DESC-DEF
MAXMA	MAX-MSL-RNG
	MAX-MSL-RNG
MAXMN	UPR-RF-RNG
MASMR	MAX-MSL-RNG
MAXPW	PW-RNG
MAXRF	UPR-RF-RNG
	UPR-RF-RNG
MAXRT	MAX-RCTN-T
	MAX-RCTN-T

MNEMONIC	ABBREVIATION
MAXSP	ACFT-VLCTY-NAUT-MI-HR
MAXSU	MAX-SU-T
MAXTD	MAX-TD-T
MCODE	MODE-CODE
MGTXT	MSG-TXT
	MSG-TXT
MIDEN	MSG-IDENT
MINMA	LWR-RF-RNG
MINMN	LWR-RF-RNG
MINMR	MIN-MSL-RNG
MINPW	PW-RNG
MINRF	LWR-RF-RNG
	LWR-RF-RNG
MINRT	MIN-RCTN-T
	MIN-RCTN-T
MINSU	MIN-SU-T
MINTD	MIN-TD-T
MINTM	MIN-TIME
MNAME	MDL-NM-PRSN
MOBIL	MBL
MOBRD	DIRT-MBL-RT
MOBRI	IMPROV-MBL-RT
MOBRP	PAVED-MBL-RT
MODAY	DA
MODEF	MOD-DEF
MODLN	MODLTN
MONTH	MONTH
	MONTH
MORIG	MESSAGE-ORIG
	MESSAGE-ORIG
MOSET	MODE-SET
MSDEF	MOSET-DEF
MSGLN	MSG-LINE-NR
MSLF	MSLF-ID
MSLLD	BSC-MSL-LOAD
MSNNO	MSN-NUM
	MSN-NUM
MSNNR	MSN-NUM
MSPTY	PRY
	PRY
NARTV	MSG-TXT
NCNTY	CNTRY-CODE
NODAY	DAYS-OF=UNIT-TNG
NODE	NODE
	NODE
OBSTH	RWY-OBSTN-HEIGHT
OBSTN	CONT-RWY-OBSTN
OBSTR	
OBSTS	RWY-CONT-OBSTN-STAT
OBTYP	ORD-BTL-TYP
	ORD-BTL-TYP
OHDAT	DT-NO-ON-HD
ONAME	OTHR-NM-PRSN
ONTUM	ORIG-UNIT-UTM
	ORIG-UNIT-UTM

MNEMONIC	ABBREVIATION
OPMOD	OP-MOD
OPRNM	OPN-NAME
ORGEO	GEO-COORD-SEC
ORGIN	MSG-ORIG
ORIGN	RCD-ORIG
ORUIC	ORIGUIC
ORUTM	ORIG-UNIT-UTM
PANAL	PF-ANAL-FCTN/NAME
	PF-ANAL-FCTN/NAME
PDAT1	DATE
PDAT2	DATE
PDAT3	DATE
PDAT4	DATE
PDAT5	DATE
PDRNG	PD-RNG
	PD-RNG
PERSNF	PERS-ID
PFUNC	PERS-FUNC
PGSZE	PLS-GP-SIZE
PINNO	PINNO
	PINNO
PLATF	PLATF-IDENT
PLATT	PLATF-TYPE
PLDAT	PREV-LOC-DTD
PLMOB	PLATF-MBL
PNAME	PERS-NAMW
PNODE	PROF-NODE
	PROF-NODE
	PROF=NODE
PNTBL	OTHR-NM-PRSN
	OTHR-NM-PRSN
	OTHR-NM-PRSN
POBOX	PO-BOX
PODEF	PLZN-DEF
POLAR	PLZN
PPDAT	DATE-PERS-PRES
PPRIDPT	GEO-COORD-SEC
	GEO-COORD-SEC
PPTGT	PRE-PLND-TGTS-IDENT
PPTID	PRE-PLND-TGTS-IDENT
	PRE-PLND-TGTS-IDENT
PPTIDPT	GEO-COORD-SEC
	GEO-COORD-SEC
PRADR	PF-ADRS
	PF-ADRS
PRAFD	NAM-ARFLD-PREV
	NAM-ARFLD-PREV
PRDOB	DOB
PRESP	PROF-ADRS-RESP-CODE
	PROF-ADRS-RESP-CODE
	PROF-ADRS-RESP-CODE
PRFRG	PRF-RNG
PRIND	PRGM-IDN
	PRGM-IND
	PRGM-IND

MNEMONIC	ABBREVIATION
PROCX	PRCS-INDEX
PRSAT	PERS-AUTH
PRTOT	PERS-AUTH-TOT
PRUTM	PREV-UTM
PSNID	PERS-ID
PSTAT	PLATF-STAT
PTFLG	PF-PRCS-FLAG
	PF-PRCS-FLAG
	PF-PRCS-FLAG
PTYPE	PLATF-TYPE
PUNIT	PRNT-UNIT
PUTM1	GEO-COORD-SEC
PUTM2	GEO-COORD-SEC
PUTM3	GEO-COORD-SEC
PUTM4	GEO-COORD-SEC
PUTM5	GEO-COORD-SEC
PWRNG	PW-RNG
RANGE	MSL-RNG
	MSL-RNG
RDRAL	RDR-ALT
RDRCO	RDR-COV
RDRNG	RDR-RNG
REACT	RCTN-T
RECLS	SECLAS-GP-REC
	SECLAS-GP-REC
REDAT	DATE
RFRNG	RF-RNG
RIID	RIIF-IDENT-FLD
RIIDPT	GEO-COORD-SEC
	GEO-COORD-SEC
RIIF	RIIF-IDENT
RIIID	RIIF-IDENT-FLD
RMARK	PUBL-RMARK
RMCLS	SECLAS-GP-RMK
RMKEY	PUB-RMK-KEY
RMKLN	RMK-LINE-NR
	RMK-LINE-RN
RMTXT	PUBL-RMK-TXT
	PUBL-RMK-TXT
RPDTG	DTG-RPTING
RQDAT	DATE-INF-REQ
RQDTG	DTG-RPTING
RQPTY	RQT-PRY
	RQT-PRY
RRDAT	DATE
RWY	RWY-IDENT
	RWY-IDENT
RWYDSG	RWY-DSG
	RWY-DSG
RWYF	RWY-IDENT
RWYFID	ARFLDF-RWY
RWYID	RWY-IDENT

MNEMONIC	ABBREVIATION
SCANP	SCNR-P
SCANT	SCNR-TYPE
SCLSG	SECLAS-GP
SCOMC	SYS-CMMPNT-EQUIP
SCOME	SYS-CMPNT-COMM
SCOMP	SYS-CMPNT
SDAT1	DATE
SDAT2	DATE
SDAT3	DATE
SDAT4	DATE
SECLS	SECLAS
	SECLAS
SECTN	SECTIONING
	SECTIONING
SEDEF	SED-CHAR-DEF
SEDSC	SED
SERNO	MSG-SER-NR
	MSG-SER-NR
SFLGW	FLGWSEC
SIGUS	SIG-USE
SITNO	SITE-NO
SMAAX	SEMI-MAJ-AXIS
SMIAX	SEMI-MIN-AXIS
SMTYP	SURF-MATL-TYPE
SNDEF	SED-FCHAR-DEF
SORCE	SOURCE
SPDEF	SED-PCHAR-DEF
SPEED	MSL-SP
PSHDL	CODEWORD
SPHER	SPHER
SPHRD	SPHER
SQNNO	SEQ-NO
SRCLO	ACT-SOURCE-UTM
	ACT-SOURCE-UTM
SRELI	EVAL OF RELIABILITY
SSTYP	SYS-SITE
STADD	ST-ARDS
STCAT	STR-CAT
STDEF	SCAN-TYP-DEF
STDTG	DTG-SITING
STIME	STMT-T-UPD
SUBID	SUBJ-IDENT
SUNIT	SUB-UNITS
SUPTP	PLATF-SU-RNG
SUPTS	SYS-SU-RNG
SURFC	SURF-MATL-TYPE
SURFS	RWY-SURFC-STAT
SUTIM	SET-UP-T-RNG
SYEQP	EQPT-REF-NO
SYMOB	SYS-MBL
TDESC	TGT-DES
TDNTP	PLATF-TR-DN-RNG
TDNTS	SYS-TR-DN-RNG
TDTIM	TR-DN-T-RNG

MNEMONIC	ABBREVIATION
TGRNO	UNIT-TGT-NO
TITLE	RPTREQ
	RPTREQ
TNGSP	TNG-SPCL-MIL
TNRES	TWN-OF-RES
TRDAT	TNG-DATE
TRHEM	TERR-HEMSPHR
TRJAL	MSL-TRAJ-ALT
	MSL-TRAJ-ALT
TRLOC	TNG-LOC
TRPLD	TROOP-OD
TRTYP	TRN-TYPE-KEY
TZONE	T-ZONE
UAIRF	UNIDENT-AUNIT
UAIRU	UNIDENT-AUNIT
UDATE	UPD-DATE
UGRID	GRID-IK-LOC
UIC	UIC
ULOCN	UTM-LOC
URDLE	SYC-SUPRT
	SYC-SUPRT
USCAN	UPR-SCRN-P
USDEF	USER-DEF
UTMLO	UTM-LOC
	UTM-LOC
UTYPE	UNIT-TYPE
	UNIT-TYPE
UTYPES	UNIT-ORG-TYPE-SPEC
	UNIT-ORG-TYPE-SPEC
UUNIT	UNIDENT-GUNIT
UUNITPT	GEO-COORD-SEC
	GEO-COORD-SEC
UUNITS	UNIDENT-ENEMY-U
WAG	WAG
WAGX	WAX-INDEX
	WAG-INDEX
WAREA	WAC
	WAC
	WAC
	WAC
WARHD	MSL-WHD
WIDTH	RWY-WIDTH
WIDTH	RWY-WIDTH-STAT
WTCAP	RQY-WT-CAP
YEAR	CONVS-COMPL-YR

APPENDIX I

ERROR MESSAGES USED IN IISS

```
LOGON -- ENTER ORGANIZATION AND USER NAME
LOGON -- ENTER PASSWORD
LOGON -- INVALID FORMAT

LOGON -- NO SECURITY HEADER FOR USER
LOGON -- LOGON COMPLETE
LOGON -- INVALID ORGANIZATION, USER, OR PASSWORD
LOGON -- USER AND DEVICE SECURITY LEVEL MISMATCH LOWER USED
LONON -- USER IS LOCKED OUT OF SYSTEM
LOGON -- MAXIMUM LOGON ATTEMPTS EXCEEDED
S10117 %6A %10A LOGGED ON %20%0 AT %2A.%4A HOURS ON %2A/%2A/%2A
S117 %6A %10 LOGGED OFF %2A%0 AT %2A.%4A HOURS ON %2A/%2A/%2A
LOGOFF -- LOGOFF COMPLETE
LOGOFF -- THIS DEVICE IS NOW HALTED
LOGOFF -- INVALID PARAMETER
INGIM -- COULD NOT FIND %8A DATA BASE
INGIM -- DATA BASE NAME SPECIFIED EXCEEDS 8 CHAR
INGIM -- NO DATA BASE NAME SPECIFIED
INGIM -- INVALID SWITCH (/SI: IS THE ONLY VALID SWITCH)
INGIM -- INVALID INPUT FORMAT FOR GIM OPTION
%8A COMMUNICATIONS ARE UNAVAILABLE AT THIS TIME
MENU -- OPTION %8A UNAVAILABLE TO THIS DEVICE
MENU -- OPTION %8A NOT FOUND IN USERS MENU FILE
MENU -- OPTION %6A TOO LONG (MAXIMUM OF 6 CHARACTERS)
INGIM -- OPTION TERMINATED
INGIM -- CONFLICT IN SPECIFICATION OF SITE
INGIM -- DATA BASE NAME CONFLICT
MTHOLD -- ILLEGAL CHARACTERS FOUND IN INPUT STREAM
MTHOLD -- WORD TOO LONG, INVALID EXECUTIVE COMMAND
MTHOLD -- DELIMITERS ARE NOT BALANCED
HELP -- HELP OPTION (SHORT/LONG) MISSING LONG DEFAULTED
OPTION            DESCRIPTION
OPTION
IBOB -- UNCORRECTABLE I/O ERROR HAS OCCURED ON UNIT %2A%0
IBOB -- STOPGIM INVOKED ON UNIT %2A%0
INTRR -- INVALID INTERRUPT REQUEST
INTRR -- STATEMENT WAITING TO BE INITIATED
INTRR -- STATEMENT IN PROGRESS %VA,%VA,%VA,%VA
INTRR -- STATEMENT WAITING FOR EXCLUSIVE USE OF RESOURCE
INTRR -- STATEMENT WAITING FOR DATA BASE MOUNT
INTRR -- STATEMENT WAITING FOR TAPE TO BE MOUNTED
INTRR -- STATEMENT IN PROGRESS
INTRR -- STATEMENT IN PROGRESS
INTRR -- PAGE = %D, LPP = %D, SKIP = %D, WAIT = %D
INTRR -- END-OF-PAGE WAIT COUNT SET
INTRR -- INVALID FORMAT ON INTERRUPT REQUEST
INTRR -- DEVICE DOES NOT SUPPORT PAGING
INTRR -- LINES PER PAGE SET TO %D
INTRR -- NEGATIVE LINES PER PAGE - NOT SET
INTRR -- PAGING DISABLED
INTRR -- OUTPUT WILL NOT BE SCRATCHED
INTASK -- CANNOT OBTAIN EXCLUSIVE USE OF DATA BASE
INTASK -- DIRECTIVE ERROR
MENU -- DATA BASE NOT DEFINED TO SYSTEM
```

```
HAS NOT BEEN INITIATED
HAS BEEN CANCELLED
HAS BEEN ABNORMALLY TERMINATED
HAS BEEN TERMINATED FOR REASONS OF SECURITY

STRTDV -- SYNTAX ERROR
STRTDV -- BAD SWITCH OR SWITCH VALUE
STRTDV -- DEVICE NOT SUPPORTED
STRTDV -- NO INPUT CAPABILITY
STRTDV -- 'LO' CANNOT BE USED WITH INPUT
STRTDV -- TASK IMAGE LOAD FAILURE
STRTDV -- DEVICE NOT DEFINED IN MENU
THIS IS NOW THE MASTER TERMINAL
STRTDV -- MT MUST BE INTERACTIVE
STRTDV -- LOGON FOR SOFT DEVICE
STRTDV -- DEVICE ALREADY ASSIGNED
STRTDV -- DEVICE UNAVAILABLE
STRTDB -- INVALID QUEUE NUMBER
 6A %10A ON UNIT %D FAILED SOFT DEVICE SECURITY
TERM -- SYSTEM TERMINATION IN PROGRESS
USER   ORG     DEV     UNIT    DATABASE        PROGRAM         SECURITY
%10A %6A %2A%0  %D.     %8A     %2R     %20A
USER   ORG     DEV     UNIT
%10A %6A %2A%0  %D.
STOPDV -- INVALID UNIT NUMBER
STOPDV -- DEVICE %D. NOT ALLOCATED
STOPDV -- DEVICE %D. STOPPED
INTRR -- MENU OPTION %2R IN PROGRESS
COPY -- %D RECORDS PROCESSED
COPY -- ERROR ON INPUT
COPY -- ERROR ON OUTPUT
COPY -- INVALID SWITCH OR FORMAT
COPY -- GETIB BUFFER OVERFLOW
COPY -- UNEXPECTED END OF INPUT
COPY -- OPEN ERROR ON OUTPUT DEVICE
COPY -- OPEN ERROR ON INPUT FILE
MSGTC -- DIRECTED OUTPUT SEND/DATA ERROR
VRCD -- INVALID RECEIVE/DATA ERROR
******WARNING: %8A COMPILE AREA THRESHOLD %D%% ******
******WARNING: %8A STRUCTURE-FILE THRESHOLD %D%% ******
UNABLE TO OBTAIN EXCLUSIVE USE.  CALL SYSTEMS
BAD DATA BASE COUNTS.  CALL SYSTEMS
%6A-%10A SIGNOFF FORCED DUE TO EXCESSIVE PSV.
%6A-%10A HAS HAD %D PSV SINCE SIGNON.
SYSTEM TERMINATION IN PROGRESS
DATA BASE %0A HAS BEEN DISABLED
ERROR IN MENU FILE.  SEE DATA BASE MANAGER
VALUE ON SWITCH WHICH REQUIRES NO VALUE
INVALID SITE SPECIFICATION
REQUIRE ADDRESSEE NOT SPECIFIED
INVALID SWITCH OR SWITCH VALUE
INPUT FILE READ ERROR
WRITE ERROR ON MSNTOS FILE
ENTER DATANET ID
```

```
INVALID SYNTAX
COMPLETED
UNABLE TO OPEN MSNTOS FILE
ERROR ON CLOSE OR ROUTE OF MSNTOS FILE
ERROR ON OPEN OF INPUT FILE
INVALID USER NAME.  TOO LONG
/FI CANNOT BE USER WITH MULTIPLE NAMES OR SWITCHES
OPENX -- REQUEST CANCELLED
OPENX -- TAPE DRIVE NOT AVAILABLE
OPENX -- INVALID DEVICE NAME
OPENX -- INVALID UIC
OPENX -- FILENAME EXCEEDED 9 CHARACTERS
OPENX -- FILE EXTENSION EXCEEDED 3 CHARACTERS
OPENX -- FILE VERSION NUMBER EXCEEDED 4 CHARACTERS
OPENX -- NO FILENAME ON INPUT
OPENX -- NO VOLUME ID ON INPUT
OPENX -- MISSING ( ) IN UIC
OPENX -- MISSING ( ) IN UIC
OPENX -- ILLEGAL CHARACTER ( %1A ) IN UIC
OPENX -- ILLEGAL CHARACTER ( %1A ) IN FILENAME
OPENX -- ILLEGAL CHARACTER ( %1A ) IN FILE EXTENSION
OPENX -- ILLEGAL CHARACTER ( %1A ) IN FILE VERSION NUMBER
OPENX -- INVALID SWITCH ( %VA )
OPENX -- %1R RUN FAILURE
OPENX -- SEND DATA FILAURE TO %1R
OPENX -- RE-OPEN SEND DATA FAILURE TO %1R
REPLY N IF NO DRIVE, D TO DELAY, OR DRIVE UNIT *
REPLY N IF NO DRIVE, D TO DELAY, OR DRIVE UNIT */VOLUME ID
INVALID PARAMETER IN STATEMENT
ERROR ON $X PARAMETER
$X PARAMETER NOT VALID FOR SCRATCH
ERROR ON QUEUE PARAMETER
QUEUE NAME GREATER THAN TEN CHARACTERS
QUEUE NAME SPECIFIED TWICE
EXCEED NO OF STATEMENTS, LIMIT=46
NON-NUMERIC STATEMENT NO
QUEUE NAME NOT FOUND
SPECIFIC ENTRY %D.%D NOT FOUND
%D ENTRIES MOVED TO QUEUE %10A
%D ENTRIES SCRATCHED FROM QUEUE %10A
OP CODE INVALID ON RETURN---CALL SYSTEMS
DETAIL SUMMARY FOR %10A %1L
SHORT SUMMARY FOR %10A %1L
%D ENTRIES - HIGHEST PRIORITY %A
PRI     STMT NO      DATE     TIME       *LINES      ROUTING
 %A    %11A  %D/%D/%D  %7A    %D         %2A
DISPLAY QUEUE IS EMPTY
MASTER TERMINAL MAY DISPLAY SPECIFIC MSG ONLY FROM OWN QUEUE
MASTER TERMINAL MUST REQUEST SUM OF OTHER QUEUE
QUEUE NAME CAN ONLY BE OWN ORG OR OPER
ONLY ONE STATEMENT NO CAN BE SPECIFIED
BOTH QUEUE AND SUM KEYWORDS SPECIFIED
INVALID PRIORITY SPECIFIED
QUEUE NAME ALREADY IN AUTO MODE
```

```
DOD QUEUE TERMINATED
DOU QUEUE TERMINATED
CAN ONLY SCRATCH OWN QUEUE
LINE SIZE NOT LARGE ENOUGH FOR DETAIL, SUMMARY GIVEN
DISPLAY Q=ALL VALID ONLY FROM MASTER TERMINAL
QUEUE NAME    NO. OF ENTRIES

REMOTE ACCESS COUNT ERROR
REMOTE -- INVALID ICF FORMAT
REMOTE -- UNABLE TO ATTACH TO REMOTE SITE
REMOTE -- UNEXPECTED LINE BREAK
REMOTE -- INVALID INTERUPT CODE
GSDRIV -- CONNECT TO IDHSC-11 COMPLETE
GSDRIV -- INVALID REQUEST
GSDRIV -- UNABLE TO CONNECT TO IDHSC-11
GSDRIV -- UNABLE TO ACCESS GLOBAL COMREG
GSDRIV -- UNABLE TO MAP TO BFRTSK
GSDRIV -- RECEIVED INVALID ICF
GSDRIV -- UNABLE TO ROLL-IN REMOTE TASK
COMSPL -- INVALID REQUEST - TOO MANY FILE SPECIFICATIONS
COMSPL -- INVALID FILE SPECIFICATION
COMSPL -- OPEN ERROR ON OUTPUT FILE
COMSPL -- MSNTOS FILE "%O" NOT PROCESSED
REMOTE USER MESSAGE FROM %10A AT SITE:%2A FOR %VA
COMSPL -- MESSAGE EXCEEDS DIRECTED OUTPUT SPOOL CAPACITY
COMSPL -- UNABLE TO QUEUE MESSAGE FOR %10A
READX -- SEND DATA FAILURE TO %1R
READX -- READ FAILURE FROM %1R
WRITEX -- SEND DATA FAILURE TO %1R
WRITEX -- WRITE FAILURE FROM %1R
CLOSEX -- SEND DATA FAILURE TO %1R
CLOSEX -- CLOSE FAILURE FROM %1R
IOWHPR --SEND DATA FILAURE TO %1R
IOWHPR -- WRITE HISTORY FAILURE FROM %1R
IOWHT -- SEND DATA FAILURE TO %1R
IOWHT -- WRITE HISTORY FAILURE FROM %1R
UPWIC -- IDHSC-11 IS ALREADY ACTIVE
UPWIC -- DSW ERROR ON SEND/DATA TO GSTASK
UPWIC -- REQUEST SENT TO GSTASK
INDO -- GSTASK NOT INITIALIZED DSW ERROR %O
INDO -- GSTASK NOT INITIALIZED QIO ERROR %O
FILE TRANS. FROM %10A AT SITE:%1A %1L FILE SPECIFICATION  %VA
YROD -- SPOOL OVERFLOW-DATA LOST

INVALID FAILSOFT CODE
EXTENDED STORAGE EXHAUSTED
SPAT OVERFLOW
HISTORY ERROR
DATA BASE I/O ERROR
END OF AVAILABLE SPACE
LINK TABLE OVERFLOW
DATA BASE EXTENDS EXCEEDED
RECORD ACCESS CONTROL ERROR
```

```
INVALID EXTENDED STORAGE SUBPOOL
TERMINAL OUTPUT LENGTH EXCEPTION
INVALID PAGE
ENTRY POINT NOT ON PAGE
LINK TABLE UNDERFLOW
UNDEFINED ENTRY POINT
DATA BASE RECORD MAP ERROR
FS -- TASK=%2R, TI=%2A%0
GSTSK -- UNABLE TO RUN DISSEMINATOR TASK
GSTSK -- DISSEMINATOR TASK (GS) NOT INSTALLED
DISCOM -- NO INPUT FOUND ON D1 CALL
DISCOM -- NO INPUT FOUND ON D2 CALL
DISCOM -- D1 AREA TOO SMALL FOR HEADER
DISCOM -- D2 AREA TOO SMALL FOR HEADER
DISCOM -- ERRONEOUR KEY FOUND BY D1
DISCOM -- ERRONEOUS KEY FOUND BY D2
DISCOM -- D1 INPUT W/O HEADER TERMINATOR
DISCOM -- D2 INPUT W/O HEADER TERMINATOR
DISCOM -- D1 INPUT LINK LOST
DISCOM -- D2 INPUT LINK LOST
DISCOM -- D1 VALUE EXCEEDS CHAR LIMIT
DISCOM -- D2 VALUE EXCEEDS CHAR LIMIT
DISCOM -- ERRONEOUS VALUE FOUND BY D1
DISCOM -- ERRONEOUS VALUE FOUND BY D2
DISADD -- DISSEM, ADD CONSTRUCT L/P END IMPROPERLY
DISADD -- DISSEM, ADD CONSTRUCT O/O END IMPROPERLY
DISADD -- JINTACCS HEADER SEQUENCE ERROR
DISADD -- JINTACCS RECORD ID NOT SPECIFIED
INPROF -- IRE DEFINITION ERROR
INPROF -- FACTOR INCLUDE/EXCLUDE ERROR
INPROF -- FACTOR KEYWORD ERROR
INPROF -- VALUE DEFINITION ERROR
INPROF -- LINE TERMINATION ERROR
INPROF -- ENTRY SIZE ERROR
INPROF -- INPUT HAS UNPAIRED QUOTE MARK
INPROF -- USER DEFINITION ERROR
IORHT -- SEND DATA FAILURE TO %T$
IORHT -- READ HISTORY FAILURE FROM %T$
RECEIVE DATA FAILURE
CORE BLOCK REQUEST FAILURE
SUPERVISOR DIRECTIVE FAILURE
WRITEX -- WRITE RANDOM ILLEGAL
CLOSEX -- FAILED TO DELETE FILE
MOUNT SCRATCH TAPE
MOUNT SCRATCH TAPE AS FOREIGN
MOUNT TAPE(S) %VA
MOUNT TAPE(S) %VA AS FOREIGN
DENSITY = 1600 BPI
DISMOUNT TAPE ON DRIVE %VA
INVALID RESPONSE
FILE %VA ON VOLUME(S) %VA HAS BEEN CLOSED WITH OPTION %VA
FILE %VA HAS BEEN CLOSED WITH OPTION XXX
LAST BLOCK PROCESSED = %VA, LAST RECORD PROCESSED = %VA
```